NOVEMBER 1955
VOL. L No. 11

VETERINARY Medicine

Established 1905

features in this issue...

50th ANNIVERSARY ISSUE

(Complete Index on Page 488)

ENTERED AS SECOND CLASS MATTER SEPTEMBER 15, 1949, AT THE POST OFFICE AT KANSAS CITY, MO. UNDER THE ACT OF MARCH 3, 1879

Published Monthly
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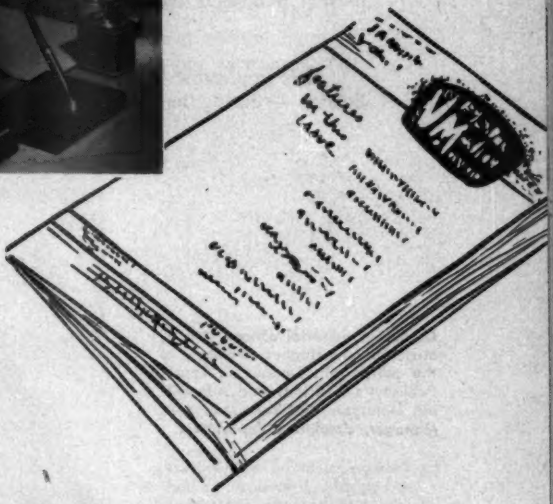

of the printer of the day. The masthead of that issue states the subscription price, "$1. per yr." Its editors: Dr. V. Schaefer, Tekamah, Nebraska; Dr. S. Kingery, Creston, Iowa; Dr. A. T. Peters, Lincoln, Nebraska.

This issue of 16 pages (5¼" x 8") featured an article of less than two pages by Dr. George P. Tucker, Lincoln, Nebraska, entitled "Value of Rectal Examination", including a clinical report of three cases of colic in horses.

Publication continued monthly, as originally planned and organized, through February 1907. With the March 1907 issue, the name was changed to the *Missouri Valley Veterinary Bulletin*, serving as the official organ of the Missouri Valley Veterinary Medical Association, now inactive. Drs. L. D. Brown, W. B. McAlester, and D. O. Kinsley were added to the three originally named as editors to serve on the editorial board. At that time a new printer, Dairyman Printing Co., also of Lincoln, Nebraska, was engaged. The magazine carried some advertising material for the first time, had acquired a separate cover, and a bulk of 32 pages.

Publication was interrupted after October 1907, the next issue appearing in April 1908 under new management. The editorial board then included Drs. A. T. Peters, G. A. Johnson, and C. H. Strange. Dr. D. M. Campbell and Dr. J. V. Lacroix were noted as editors and the publication offices were moved to Hiawatha, Kansas. In that issue, (April 1908) it was stated editorially that temporary discontinuance was due to the editor not being able to secure papers suitable for publication and lack of reader interest. It was noted also that in spite of the common impression to the contrary, the *Bulletin* was owned by the Iowa-Nebraska Association and then, after the amalgamation, became the property of the Missouri Valley Veterinary Association, consisting, at that time, of approximately 250

members. Except for that brief period (five months), VETERINARY MEDICINE has been published monthly, continuously from November 1905 to date.

Comprehensive discussions began to appear with illustrations. The June 1908 issue consisted of 58 pages. Plans were made for even greater expansion, and subjects for months in advance were announced.

The *Bulletin* was published monthly without interruption in Hiawatha, Kansas, until April 1910, at which time new rulings made publication burdensome to the Association, and at the meeting in Omaha, Editor Campbell (already moved to Chicago) acquired the monthly as a private enterprise. The magazine was published in Chicago beginning with the issue for July 1910 under the new name of the *American Journal of Veterinary Medicine* (see illustration of masthead). Ten years later (November 1920) the name again was changed to VETERINARY MEDICINE, which it has borne since. Doctor Campbell released control by sale to the present publishers on May 1, 1949.

The Early Years

It is impossible to recreate the atmosphere soon after the beginning of publication — during the spring months of 1906 — when the meat inspection law was

Corner of editorial offices, (l to r) Miss Kathleen Hughes, Secretary to the editor; Mr. Donald C. Leach, Publisher's Assistant and Advertising Manager; Miss Vera Mae Yort, Manager, circulation department.

Mr. Donald C. Leach
Publisher's Assistant
and Advertising Manager

proposed and passed. Late in April of that year, Senator Beveridge of Indiana, introduced a bill providing federal meat inspection for both interstate and foreign trade. Calling for antemortem and mandatory postmortem inspection and destruction of condemned carcasses, the measure went several long steps forward by expanding inspection to cover canning and packing of all meat products for interstate shipment and by acquiring maintenance of sanitary plant conditions under rules to be laid down by the Secretary of Agriculture.

It was noted also in early issues that federal appropriation for cattle tick eradication was made. It took 17 years to free 75% of the 730,000 square miles of territory first placed under quarantine. The San Francisco earthquake and fire struck in Apil 1906; 35,000 lb. of antiphlogistine was dispatched to the city for free distribution among relief stations. Announcement was made that pasteurization killed practically all pathogenic organisms in milk.

1908-09. Persons who died of tuberculosis exceeded 81,000. Dr. A. D. Melvin, chief of the BAI, told the American Meat Packers Association that he planned to move in on tuberculosis and eradicate the disease from American livestock.

Automatic addressographing of mailing envelopes. Background — graphotype machine for stencil preparation of addresses.

Circulation office, (l to r) Miss Mary Lou Smith, Circulation Clerk at the Cardineer record of subscribers; Miss Vera Mae Yort, Circulation Manager.

VIEWS IN THE PRINTING PLANT

(1) Linotype machines set copy for VETERINARY MEDICINE, Times Roman 9-point font set on 10-point slugs is used for all narrative copy. (2) Composition — 8-page form. Latest modern equipment is employed for best possible results. (3) Letterpress printing; (l to r) Doctor Anderes and Mr. Edward Nastali (Plant Superintendent, Ashcraft, Inc.) examine press sheet. Pressman at far right. (4) Gathering, stitching, and trimming; the final operation prior to mailing is accomplished promptly, assuring mailing on publication date.

Eight (8) bound volumes (1946-1953) illustrating authorized publisher's binding of annual volumes with index.

From the table below it may be seen that there were in the United States in 1910, a total of over 653,000,000 head of livestock having an approximate value of $10,000,000,000., excluding poultry, small animals, wild, and circus animals. At the same time approximately 10,000 practitioners were engaged in caring for the health of these farm animals, the majority located in Nebraska, Iowa, Missouri, and Kansas. Disease took a heavy toll. Hog losses were 43.4 per 1,000 head, the lowest recorded by the BAI up to that time.

Rabies was widespread in all species. Equine glanders was prevalent. Horses were destroyed, in most cases, by the sheriff after appraisal at the county court. Maximum indemnity was set at $25.

The price of milk in New York City rose to the astronomical figure of nine cents a quart and turmoil raged. "— — — nor does all complaint come from the consumer who is compelled to pay an exhorbitant price for his milk; the farmers, too, have complained". Indignant mothers held milk-meetings. Bacterins were coming into their own and were used in every conceivable condition, and in some inconceivable ones.

In 1910, Dr. A. T. Kinsley of Kansas City, then president of the Missouri Valley Association, gave the animal population of the country at these figures:

	No. of Animals	Valuation
Horses	23,976,881	$2,684,000,000.
Mules	4,296,908	584,000,000.
Beef Cattle	47,922,409	934,400,000.
Dairy Cattle	22,774,033	814,800,000.
Sheep	57,447,301	229,800,000.
Hogs	494,600,114	4,534,800,000.

All in all, the first decade of the century was a prosperous one for veterinary practitioners. The number of horses and mules was steadily increasing and by the end of this period, quality was improving. Improved cattle breeding, particularly of dairy cattle, was receiving more attention than farming. Activity was associated with the newly adopted County Agent System which furnished increasing demand for veterinary service.

Golden Jubilee

VETERINARY MEDICINE has been recording events and developments for a period that constitutes an enviable record of veterinary journalism.

This, the Golden Anniversary Issue, is subdivided into a series of articles. The first has to do with the fascinating job of the staff pictured, which is both voluminous and manifold. From a mass of reports, notes of addresses, sketches, pictures, drawings, and comments from a wide variety of publications in allied fields, there emerges each month an organized book. In each of these are con-

tained many suggestions, ideas, and recommendations of a dozen or more authors. Selection, editing, layout, and finally a "dummy" magazine is built to guide the typesetter, layout man, and printer. All of these operations are performed against an advanced deadline date when work must be completed in order that mailing schedules can be met. After printing, arrangements must be made for a copy to reach each subscriber promptly, which in itself poses problems of keeping up-to-date with new subscribers and following locations of old ones.

Articles have been prepared especially for this issue by a group of authors who, by their service to the profession, have deserved the designation of international authorities. Most of these are confined to happenings during the past 50 years that VETERINARY MEDICINE has been in existence. Some abbreviated descriptions of preceding eras are included for completeness. They recount veterinary history. Prognostications are made, colorful figures recalled, recent advances chronicled, and varied facets of veterinary science given due respect. Space limitations make deserving and exhaustive treatment of each of these specialties impossible. All of this may be considered as a brief pause to contemplate events of the past that influence the favorable position we occupy in modern society, to give substance and expression to advancement and present day practices, and to forecast what may be expected in the future.

Today, as always, VETERINARY MEDICINE is devoted to the promotion of the art and science of veterinary medicine. Its character has undergone a gradual change, helping to advance the pace of progress and provide leadership and assistance in directing professional efforts to greater accomplishments against old enemies and into new channels.

Much remains to be done. No more impressive reason why is that existing in the official statement that, for the past decade, livestock diseases and parasites took a toll of nearly $3,000,000,000. yearly. A challenge exists, and is apparent in these figures.

The future of veterinary medicine is bright. It has become of age as a science. Better training for veterinary students, improved tools, technics, and agents, now make possible superior service to the livestock industry. All of these matters are continuously under study and change, progressing ever nearer perfection.

ANNIVERSARY MESSAGES

Message from the Executive Secretary, American Veterinary Medical Association

Of the basic elements which, together, go to make up a profession such as veterinary medicine, its literature is one of the most important in helping to advance the science and in measuring the accomplishments of the profession.

Through the medium of good periodicals and books, the members of the profession are kept informed of new findings in research and practice, improved methods of diagnosis, treatment and prevention of animal disease, new rules and regulations for the control of communicable diseases, and new developments affecting the interests of veterinarians, individually and collectively, as a profession, in relation to the clientele and public which they serve.

Dr. J. G. Hardenbergh

While veterinary medical science in this country does not have a large number of periodicals devoted to it, yet the science and the profession have been well served over the years by the several journals with general and national circulation among veterinarians. Among these, VETERINARY MEDICINE has a long and distinguished record.

On behalf of the American Veterinary Medical Association and its publications, and also personally, it is a distinct privilege to add a message to others that will help to commemorate the 50th Anniversary of VETERINARY MEDICINE. May it continue to serve well the rapidly growing profession of veterinary medicine for many years to come.—*Dr. J. G. Hardenbergh, Executive Secretary and Managing Editor—American Veterinary Medical Association.*

Congratulations on Your Golden Anniversary

The British Veterinary Journal was founded in 1875 by Dr. George Flemming and, after 80 years of continuous publication, it is the senior of all the extant veterinary periodicals in the British Commonwealth.

The editors and publishers are proud of this record and, conscious of the achievement, they welcome the opportunity to send fraternal salutation and congratulations to a sister journal across the seas on the auspicious occasion when VETERINARY MEDICINE celebrates its Golden Anniversary, marking 50 years of continuous publication.

The two journals have much in common. In each instance they owe a great debt to the initiative, genius, and energy of one man:

Professor J. McCunn

Flemming of the VETERINARY JOURNAL, and Campbell of VETERINARY MEDICINE. Both periodicals are independent and not trammelled by any restrictions of thought, policy, or action enunciated by committee or council, which might suborn vitality. They provide a forum in which a man can give expression to his views and ideas, without fear or favour and even if they are not in accordance with prevailing themes.

Past volumes serve as a mirror whose reflections depict, in ordered sequence, the great changes that have motivated the art and science of veterinary practice.

Few callings have witnessed such a revolution in the field of endeavor as that of the veterinary surgeon during the last 50 years. When we turn to the first pages of VETERINARY MEDICINE we observe that the horse held pride of place. Next the dog made challenge for supremacy and now both make way for the ox and preventive medicine. These changes in outlook have been impelled by changes in the way of life initiated by man's inventive genius and by economic and sentimental forces. We can read and learn that veterinary surgeons have been able to accommodate to the new and ever changing conditions with a remarkable facility. The pages tell how science has made an ever-growing impact upon the veterinary art.

In the early days most of the literary material recorded the personal observations and conceptions of those who practiced their profession in the field. Now many of the articles set forth the results of experimental tests recorded with scientific precision. Whilst one must be deeply conscious of all that we owe to the scientific workers in the laboratories, one can not but regret that the ink in the clinician's pen seems to have dried up in almost exact proportion to the flux of those wielded by the research workers. Most members of the veterinary profession pursue their calling in the field. They are hungry for the type of article which provides them with diagnostic, therapeutic, and surgical information. Much of the erudite, modern, scientific material, except probably for the summary at the end, is beyond their immediate comprehension and indeed it is often beyond the understanding of all except those few who happen to be working in the same or similar fields. VETERINARY MEDICINE seems to be able to keep a fair balance between the two types of material which we might classify as being of clinical and laboratory origin.

In thanking the editor and publishers for their good services in the present, and in the past, and wishing them every success in the future, may I add a simple request: Please keep on publishing the clinical articles.—*Professor J. McCunn, M.R.C.V.S., M.R.C.S., L.R.C.P., Editor, The British Veterinary Journal, London, England.*

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Service to the Profession

It is a pleasure to extend greetings to VETERINARY MEDICINE on the occasion of its Golden Anniversary.

Those who are in any manner concerned with publications in the field of veterinary medicine know how exceedingly complex this field has become. A half-century ago, the important animal was the horse and the impact of science on the profession was not marked as it is today. During this half-century, specialties have arisen and practice in many respects has become defined along different lines than in the past. An entrance has been made into the field of public health. The regulatory officer has become charged with additional responsibilities. The laboratory worker has become a scientist in fact as well as in name. In a word, these last 50 years have witnessed an enormous change in the field of veterinary medicine.

Dr. Charles A. Mitchell

The publications which serve a profession are, to a considerable extent, the barometers by which the efficiency and standing of that profession may be judged. The collection of data, their classification and the presentation of new scientific discoveries are the every day function of a professional journal. The manner in which this is carried out, however, must to a considerable extent, depend on the audience addressed and the objective at hand. It follows, therefore, that veterinary journals with diversities of interest are bound to each possess a character of its own, determined in large measure by the objectives in mind and the manner in which these are worked out. Scanning the pages of VETERINARY MEDICINE over a considerable number of years would seem to indicate that it was decided very early that this Journal should serve a wide audience of practitioners and that, in general, the contributions should cover a wide field in a condensed form, permitting easy assimilation in a minimum of time. A policy of this kind was an admirable approach and was bound to make a marked impact on the veterinary profession of North America.

It is the earnest hope of the *Canadian Journal of Comparative Medicine and Veterinary Science* that the years which lie ahead continue to witness in the future, as in the past, the splendid contributions of VETERINARY MEDICINE.

Chas. A. Mitchell, Editorial Board, Canadian Journal of Comparative Medicine and Veterinary Science.

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A Contribution to Progress

The independent veterinary journals have made a contribution to progress in the science and art of veterinary medicine in America. Evidence of this fact is manifested by the consistently large percentage of all veterinary practitioners who are now and who have been subscribers to VETERINARY MEDICINE.

Our felicitations to the editor of VETERINARY MEDICINE and his staff; may your publication continue to flourish for at least another half century.—*J. V. Lacroix, D.V.M., Editor, The North American Veterinarian.*

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Useful in Israel

The 50th anniversary of the publication of VETERINARY MEDICINE is a fitting occasion to pay tribute to your Journal and to review briefly its importance for the 160 veterinarians in Israel.

Living in a small country of 1,600,000 inhabitants, somewhat distant from the centers of research, we have of necessity, more than others, to rely to a large extent on literature to keep us up-to-date on what is happening and particularly in the United States, and to improve the standards of our profession. These needs are admirably filled by VETERINARY MEDICINE. In view of the limited resources of the State of Israel the greatest importance attaches to the preservation of the health of our livestock, and the veterinarians here are encouraged and aided in their difficult work in no small measure by the new findings through research reported in your publication. Moreover, your page-filling notes also enrich our knowledge of what is happening in the field of human medicine. In short, VETERINARY MEDICINE supplies us with a wealth of information much needed in Israel.

Please accept our congratulations on 50 years of publication of which you may be justly proud, and our best wishes for many more such half-centuries of successfully meeting the challenge posed by the science of veterinary medicine. — *F. G. Sulman, M.D., D.V.M., Hon. Editor, Refuah Veterinarith (Veterinary Medicine).*

P. Srinivasa Rao, G.M.V.C.

A Message from India

Veterinary journalism, all the world over, can not lay claim to great antiquity. It is therefore something to be proud of, when our contemporary VETERINARY MEDICINE of America is celebrating its Golden Jubilee this year. It has been our good fortune to be closely acquainted with that Journal during the last 31 years. It always gave us pleasure to go through its pages and be benefited. We always envied the standard of publication of that Journal and often thought of "The stern delight of accomplished effort" which the management should be deriving from its appearance — month after month.

Three stone-cutters were at work and a passer-by said to each one in turn, "What are you doing?" One said, "I am cutting stone". The next replied, "I am earning my living." The answer of the third was, "I am building a cathedral." It is such consciousness of serving a great cause that enlivens the life of veterinary journalists and serves as a great incentive for further efforts.

We make bold to say that VETERINARY MEDICINE has many more years of useful life before it and we wish the enterprise continued success and prosperity, which it so richly deserves. — *P. Srinivasa Rao, G.M.V.C., Editor, The Indian Veterinary Journal, Madras, India.*

Greetings from Dog World

In a new land like America, 50 years is a very long period. In the veterinary profession, a half century marks a forward step, perhaps more than in almost any other calling. I doubt that any profession has progressed as rapidly as has the veterinary profession.

My memory goes back almost 35 years in the dog field. In the beginning, antagonism between the dog breeders and exhibitors on the one hand and veterinarians on the other, was intense and bitter. I am not going into the details except to say that perhaps there was some justification on both sides.

Fortunately the era of kennel veterinarians and breeder scientists went by the boards a long time ago in the dog fancy. The old dog books were filled with detailed instructions on how to treat and "cure" anything from an inflamed eye to an abcess in the liver. Many dog breeders were their own pharmacists. Here, indeed, was a case of where a little learning was a most dangerous thing.

On the other hand, the veterinary profession has made the dog and other small animals a major theme in college courses. The increase in the number of small animal hospitals has been tremendous. The increase in professional

Capt. Will Judy

knowledge and efficiency has been even greater. Practically every dog owner today is gratified to know that the veterinarian in his neighborhood has had extensive preparation fully as strict as that for the physician. No dog breeder now refers to a veterinarian as a "horse doctor."

Both sides have done well and have come to an understanding of each other. Today, most of the 17,000,000 dog owners in America do not begrudge the fee paid to the veterinarian for care and treatment of their pets. Also, *Dog World's* staff has followed the policy that to explain the necessity for scientific knowledge demands that no one try to be a veterinarian in his own home. The greater the knowledge of this sort on the part of the dog owner, the more willing he is to patronize the veterinarian.

In all this I want to pay tribute to the veterinary press. The national association has become an efficient, alert, and both an aggressive and progressive force. I particularly pay compliment to the independent veterinary mazazines which, at times, have struggled courageously to give service to the profession; often under financial difficulties. The situation has changed and today the independent veterinary press is a vital, appreciated factor in the profession.

I particularly think of my old-time friend, the late Dr. D. M. Campbell and the happy combination of theory and practice he made use of in the columns of VETERINARY MEDICINE. Under the later ownership of Doctor Anderes, this publication has lived up to a grand tradition and I wish it another 50 years of service, progress, and success.—*Will Judy, Editor, Dog World, Chicago, Illinois.*

On the Etiology of Charbon

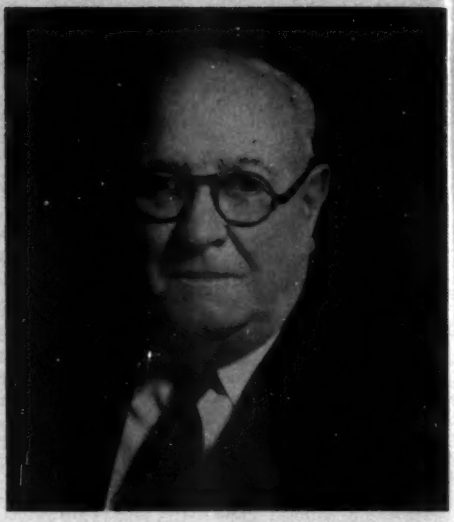
The *Journal d' Agriculture Pratique* of France contained a paper read by M. Pasteur before the Academy of Science in which he is quoted as saying: "Whence comes this disease? How is it propagated? Is it not possible that an exact knowledge of its etiology may lead to prophylactic measures which may be easily applied and suited for rapidly extinguishing this redoubtable disease?" These are the questions I have proposed to solve, and for this purpose I have secured the cooperation of two zealous young observers, M. M. Chamberland and Roux, as enthusiastic as I with regard to the great questions raised by the study of contagious diseases.

"It has long been believed that charbon arose spontaneously under the influence of different occasional causes. Nature of soil, water, forage, mode of breeding and fattening have all been invoked to explain its spontaneous existence, but since the labors of Doraine and Delaford in France, of Pollender and de Bréell in Germany have called attention to the presence of a microscopic parasite in the blood of animals dead from this disease; since rigorous research has victoriously combatted the doctrine of the spontaneous generation of microscopic beings, and finally, since the effects of the principal fermentations have been ascribed to microbes, we have gradually become accustomed to the idea that animals attacked by charbon may take the germs of the parasite from the external world, without there being a spontaneous birth, properly so-called, of the affection. This opinion was still further confirmed when Dr. Koch, of Breslau, in 1876, demonstrated that bacteridium, under the form of vibriones or bacillus, may be resolved into germ corpuscles or spores".

Later, M. Pasteur presented a brief paper before the *l'Academic des Sciences des Paris,* in which he said: "I have presented a collection of results giving the key to the etiology of charbonnous affections in countries where this disease is enzootic. To sum up in a few words, a charbonnous animal is buried; the parasite causing the disease and filling the blood is propagated in the earth surrounding the cadaver, and is there reduced to the state of germs. They would be inoffensive if they remained within the earth, but earth worms bring them from below to the surface. Then rains and cperations of culture distribute them over plants, or, under favorable circumstances, water carries them to the streams. As a consequence, these germs of disease pass into the bodies of animals, and there develop the infectious parasite.

"I am strongly desirous of supporting these principles with as many proofs as possible, in order that all minds, even those most prejudiced in favor of the spontaneity of contagious diseases, shall be obliged to accept them."—*From U.S.D.A. Special Report No. 34 entitled Contagious Diseases of Domesticated Animals, published 1881.*

A Look At The Record



Dr. Louis A. Merillat

It is a pleasure of no small dimension to participate in the celebration of the semi-centennial anniversary of VETERINARY MEDICINE for, as I frequently told my old friend, colleague, and neighbor, the late Dr. D. M. Campbell, the journal he had developed was commanding a master place in the veterinary whirl, not only of this country but of the entire world. As much as this may seem like loose talk to the casual observer, the fact is not hard to sustain. Just after the turn of the century when VETERINARY MEDICINE, under the name of *American Journal of Veterinary Medicine,* was started, the total readers of current veterinary literature were a paltry few, and moreover, the journals available devoted themselves mainly to the printing of scientific writings and without concurrent effort to promote the application of veterinary science in the field. What I am trying to say in this awkward fashion, is that while editors did a good enough job of assembling available scientific knowledge, they did not plan and promote programs for its economical usage, which is one way of saying that the current literature of the 19th century did not help much in creating a veterinary profession *per se.*

Here is where VETERINARY MEDICINE came upon the scene and filled the gap with a journal designed to look after the personal welfare of those earning a living in the field of practice and thereby, for the first time, made the reading of the periodical literature a more universal habit and popular pastime. Proof of this was the mounting circulation of VETERINARY MEDICINE during the very year that the other veterinary journals were moribund from financial troubles. Only one, *The American Veterinary Review,* survived and that one was saved from extinction through its purchase in 1915 by the American Veterinary Medical Association. The rapid growth of this journal is all the more remarkable in view of the fact that it came while the profession was suffering the tragic vanishing of the horse from the urban centers and its being replaced with painful speed by the automobile and truck. It would require volumes to relate fully the details of the phenomenal metamorphosis and its deadly effects on the personnel of veterinary avocation; the transformation from equine to a more general practice among all livestock. Applied veterinary medicine had been so predominantly solidified that we in the cities did not realize that after all the animals with "more than one toe" were the real substance of our vast livestock industry.

As I trace the picture that unfolded during my long life as a practitioner and author, the so-called "passing of the horse" was more of a boost than a harm inasmuch as making a living from "horse doctoring" was blinding us from our main obligation, the protection of the nation's greatest asset, livestock — its production, preservation of its health, and wholesome utilization of its products.

It seems to me that when Doctor Campbell brought a small, local, veterinary journal from Kansas to Chicago shortly after the turn of the century and named it *The American Journal of Veterinary Medicine,* he was deeply moved by the vastness of the livestock field and its importance to the wellbeing of the people, and therefore, assumed the big responsibility, not only of advancing the science of animal medicine but also of cultivating the material interest of professional men who practiced it in the farm and home.

As Al Smith used to say, "Let's look at the record". It is a notorious fact that few veterinarians bother to take a look at the troublesome past of their calling, particularly not of the distressing life of their current literature. *The American Veterinary Review*, (founded 1877) had a shifting, precarious existence until, in veritable bankruptcy, it was taken over by the A.V.M.A. in 1915. In the interim, (1877-1915), it was owned, at least partly, and edited by no fewer than seven different persons, each one dropping it with burned fingers. All of these details, good and bad, are found in Veterinary Military History, Vol. 1, pp. 431-434. *The Journal of Comparative Medicine and Veterinary Archives*, renamed from *Archives of Comparative Medicine and Surgery* (1880-1892), was an excellent publication, but is best remembered for the disappointing irregularity of its issues, at least during the first 12 years. Its master mind, owner, benefactor and editor, was the well-to-do Philadelphian, Dr. Rush Shippen Huidekoper, who willingly took up the deficits. With his death (1901) so went another veterinary journal. *The Veterinary Gazette* of New York City (1880-1892), published and edited by the faculty of the Columbia Veterinary College, and *The Veterinary Magazine* of Philadelphia, launched by faculty members of the University of Pennsylvania, barely survived into their third years. One could name a long list of less known journals which bobbed up, only to wilt and fade from the scene, whatever was their source or their objective or their backing. Only *The American Journal of Veterinary Medicine* (1905-), and *The Cornell Veterinarian* (1911-), and *The North American Veterinarian* (1920-), have "what it takes" to carry on. How come? The answer is simple enough. *The American Journal of Veterinary Medicine* (now, VETERINARY MEDICINE) forthwith captured the interest of the practitioners by teaching them to read about the art as well as the science of their exploitation. Anyway, that's the way it looks from here.—*L. A. Merillat, D.V.M., Editor Emeritus, Journal of the American Veterinary Medical Association, Chicago, Illinois.*

Changing Diets

Contrasting the eating habits of Americans today with those of the late '20's, it has been noted that each family in this country eats 32% less potatoes, 30% less flour and cereal products, and 11% less sugar. They have increased consumption of red meat by 19%, eaten 12% more poultry, 15% more eggs, and 7% more dairy products despite a 50% reduction in butter consumption. Also noted increased is the coffee, tea, and cocoa drinking habit, which has climbed 23% during the last three decades.

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Successful Control of Fowl Typhoid

Medication with furazolidone (furoxone,® Eaton) reduced mortality and morbidity in an epizootic of fowl typhoid in chickens, reports F. R. Lucas, Maryland State Board of Agriculture, in *Poultry Science*, 34:440, Mar., 1955. Fifty-four chickens treated with furazolidone in mash at 0.011% for two weeks appeared normal 24 days after treatment. However, three random birds sacrificed at this time proved to be carriers of the causative organism, *Salmonella gallinarum*. Before furazolidone was administered, there were 19 fatalities. Two birds died during the first two days of treatment.

Consultation and Referrals

The newly adopted code of Ethics of the Massachusetts Veterinary Association spells out the meaning of consultations and referrals and gives requirements for standard deportment.

"Veterinarians should distinguish between consultations and referrals.

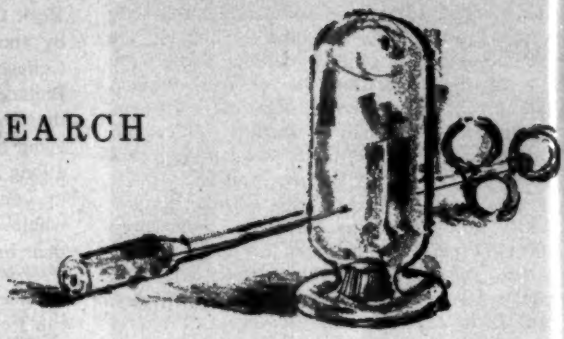
"A consultation takes place when a doctor treating a patient meets with another doctor to discuss the prognosis and course of treatment for the patient's illness. The original veterinarian continues in charge of the case; the consultant has no further duty after the consultation is over.

"In the case of a referral, the veterinarian in charge of a patient sends the patient to another veterinarian for treatment during the present illness. The first veterinarian is relieved of further responsibility or financial interest in the case, these being assumed by the second veterinarian who renders his bill directly to the client. As a matter of courtesy, a report of the outcome should be sent to the referring veterinarian".

▼ ▼ ▼

Epidemiological reports reveal that 90% of human psittacosis cases have followed contact with parakeets.

REPORT ON
RECENT RESEARCH



Light worm loads are putting a serious drag on most "healthy" cattle

**Two-year tests were conducted on 600 lightly parasitized calves. Those treated with phenothiazine under the two-way program produced better gain than the untreated group.*

Tests show that stomach worms are robbing cattle of growth and vigor, stealing profits from practically every herd in the country . . . even in the colder northern states. While most of the infections are light, and few animals show clinical symptoms, the conditions represent a substantial part of the ½ billion dollars lost annually to internal parasites.

Now, field studies* prove that much of this loss can be prevented. A two-way program of control with the anthelminthic phenothiazine is recommended. First, use therapeutic doses of the drug to eliminate adult worms; then keep down reinfection and suppress the production of viable parasite eggs with low-level feeding of phenothiazine in supplement, mineral mix, or salt.

NEW INFORMATION ABOUT INTERNAL PARASITES, a review of developments in livestock parasitology is compiled periodically by the Du Pont Company for veterinarians and animal health specialists. To receive it regularly—or for specific information on the control of internal parasites with phenothiazine, simply write to E. I. du Pont de Nemours & Co. (Inc.), Grasselli Chemicals Department, Animal Industry and Nutrition Section, Wilmington 98, Delaware. Phenothiazine products are available through suppliers of veterinary products.

DU PONT
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BETTER THINGS FOR BETTER LIVING
. . . THROUGH CHEMISTRY

Phenothiazine

Our Professional Heritage

A. H. QUIN,* D.V.M.,
Kansas City, Missouri

IT is unfortunate that we do not have a well-documented history of veterinary medicine. Such a text would be invaluable in the education of veterinary students and would give all who read a greater appreciation of our profession's contributions, not only to agriculture and public health, but also to the welfare of mankind.

Veterinary medicine is one of the world's most ancient arts, albeit a still young science. Prehistoric man soon learned that the clay poultices, the soothing herbs, the sharp stone to an abscess, were as helpful in relieving the afflictions suffered by his wolf dog as himself.

Pre-Christian Eras

In recorded history, the Hammerubian tablets, dating back to 3,000 B.C. mention diseases of animals and measures for their relief. Similar historic references have been deciphered from Pre-Christian Greek, Hindu, and Chinese documents.

Moses, in laying down definite laws governing meat consumption, banned pork because of a practical knowledge of trichinosis and its human health hazards.

When ancient Roman legions embarked on conquest they were accompanied by veterinarians, soldiers trained for the care of cavalry and pack animals in health and disease.

Pliny the Elder, and Hippocrates long before him, wrote vividly descriptive treatises on rabies. Pliny advised that a human being bitten by a rabid dog or wolf should consume daily a portion of raw liver from a rabid animal. Who can say but that this crude precursor of Pasteur's vaccine, this peroral antigen, might not have had a measure of value in rabies prophylaxis?

Vegetius in the fourth century A.D. wrote a quite good text on animal diseases, veterinary medicine, and surgery.

*A.V.M.A. President, 1954-55; Vice-Pres. and Director of Professional Services, Jensen-Salsbery Laboratories, Kansas City, Missouri.

Dr. A. H. Quin

During his term as president-elect and president of the A.V.M.A. (1953-'55), Doctor Quin presented historical highlights of the veterinary profession at many banquets of veterinarians, their wives and guests. The material and facts incorporated in this transcript of Doctor Quin's address should be of value to veterinarians, or their wives, who are called on to speak before groups in public. It also should aid the veterinary student in a greater appreciation of the history and accomplishments of his chosen profession.

During the centuries of Arabian culture, veterinary medicine developed hand in hand with human medicine to reach comparatively high levels of attainment.

The Dark Ages

Then darkness fell. Bubonic plague in sweeping outbreaks of unprecedented devastation, killed a fourth of the civilized world's population. All science, all learning, disappeared in the abyss, and barbarism reigned for three centuries. Medicine went to the leeches. Surgery was the province of the barber. Veterinary medicine was relegated to the hands of the farrier. Medicology, human and veterinary, was replaced by witchcraft, incantations and quackery with cruelty the order of the day.

Even today in this atomic age, the remnants of medievalism remain. "Hollow horn" and "wolf-in-the-tail" are still treated in remote rural areas. Quackery still reigns supreme, for

the bleeding fleam and the seton have been replaced by sulfonamides and antibiotics in the hands of the untrained.

Claude Bourgelat, 1712-1779

Born to luxury and educated for the law he gained international renown as a horseman. He wrote much; founded the Royal Veterinary School of Lyons in 1761, and the Veterinary School at Paris (Alfort) in 1765. These schools are still operating.

The Renaissance

In the early half of the 18th century, Bourgelat — skilled equestrian courtier and soldier — was sickened by the devastating death rate of cavalry and artillery horses of the French armies. Glanders, epizooty (strangles), septic wounds, lameness, lockjaw, and other equine maladies had disrupted many campaigns and battle plans.

Bourgelat laid the problem before the French king and obtained a royal charter to establish a school for farriers, "That they might be better skilled in the arts of veterinary medicine and surgery." This school was established in Lyon, France, in 1761, and remains today one of the leading colleges of veterinary medicine.

By the turn of the century, veterinary schools had been started at Vienna, Hanover, and other cities of Europe. The Royal College of Veterinary Surgeons was opened at London in 1803.

Veterinary Education in America

Veterinary education was slow in bridging the Atlantic to America.

The first school, an abortive effort by Dadd, was started at Boston in 1854. Then, under official approval of the province, Dr. Andrew Smith was brought over from Britain in 1860 to establish the Ontario Veterinary College at Toronto. Two terms of six months each qualified the graduate for a certificate of veterinary surgeon. Soon after, a school was established at McGill in Montreal, a school where Osler, master of modern medicine, taught physiology to veterinary students. The veterinary school at Ames was established in 1869 with four students in its first graduating class.

Skilled veterinary service by early graduates carried an appeal to horsemen and livestock owners. The demand for more of these "vetinaries" was solid and apparent.

Thus the era of the private veterinary college was born, some to fail dismally, others to attain quite high standards. The last private school — the Indiana Veterinary College — closed in 1922.

These private schools had accomplished a great mission for they brought some 3,500 veterinarians by the turn of the century, into a field previously preempted by the quack and the empiric.

As of 1955, we have 17 schools in the United States and two in Canada, all at university level with a standardized degree after six years of technical training.

Diverse Accomplishments

Thus, in a profession which has even yet to celebrate its centennial in America, we can point to a vast panorama of developments and accomplishments.

We have seen the establishment of small animal practice as an exact clinical science with some 2,500 well appointed hospitals.

We have seen the total eradication of contagious bovine pleuro-pneumonia, glanders, foot and mouth disease, and tick fever.

Currently we are witnessing the planned eradication of brucellosis, vesicular exanthema, blue tongue, bovine and ovine scabies, and transmissive menaces.

In cooperation with our allied sciences of bacteriology and parasitology we have developed numerous immunizing agents as well as effective remedies against a host of serious parasites.

We have developed veterinary research to high standards of excellence and spread a net-

work of skilled practitioners to every livestock area in the nation.

A hundred dramatic sagas could be written about specific contributions of veterinarians to the welfare of the husbandry industries, contributions that actually have contributed countless millions of dollars to our national economy. Let us turn, however, to some of the less publicized contributions of veterinarians to the welfare of mankind.

Ramon

All down through history dreaded lockjaw —spore-borne tetanus—was a fatal hazard to both civilian and military populations. In the wars of history, including our war between the states, this killer took as high as 68 of each 1,000 wounded soldiers. In World War II, deaths of our troops from lockjaw could be counted on the fingers of one hand.

A twin killer, the toxin-forming diphtheria bacillus, filled the graveyards of the world with children all through previous centuries.

We can thank a veterinarian, Gaston Ramon of the Pasteur Institute, Paris, France, for tetanus and diphtheria toxoids, effective agents that create solid immunity against these two plagues of man.

Ramon, still living and still working, is a name unknown to the millions of mothers who take babies and children for the preventive "shots" against lockjaw and diphtheria but they can be forever grateful to him.

Maurice Hall

Within the memory of the middle-aged, human hookworm disease — uncinariasis — held people on millions of miles of the earth's surface in a state of subnormal health and economic bondage.

In the mid-twenties, a veterinarian, Dr. Maurice Hall and his co-workers of the Zoological Division of the Bureau of Animal Industry announced that a common hat cleaner—carbon tetrachloride—was an effective anthelmintic for hookworms. Further research developed the improved and safer tetrachloroethylene.

This contribution by Hall made possible the rehabilitation of entire countries and opened the gates of better health and productive enterprise for millions of people.

Franz Benesch

Not many decades ago, spinal anesthesia was used sparingly, if at all, in human surgery and obstetrics. Today it is used universally and carries an almost negligible number of post-operative complications.

We can state rightfully that Dr. Franz Benesch of the Vienna, Austria, Veterinary Clinic lent major impetus to the employment of spinal anesthesia. Thirty years ago he reported the use of caudal anesthesia in cattle and horses — the technic of injecting the anesthetic posterior to the cauda equina. This technic was safer than the classic puncture of the meninges and its use has vastly broadened the indications for this mode of anesthesia.

Cooper Curtice

The original postulation of a veterinarian has made possible all of our intricate knowledge of vector-borne diseases and their control.

In 1887, Dr. Cooper Curtice, a field veterinarian of the federal Bureau of Animal Industry, gave a historic paper before a meeting of zoologists in Washington, D. C. His field observations had led him to be sure that a particular species of tick, *Margaropus annulatus*, carried and transmitted the causative agent of bovine Texas fever. This lead was followed by the epochal report of Smith and Kilbourne in 1893 that the protozoan parasite, *Piroplasma bigemina*, transmitted by the lone star tick was the true cause of the disease.

Thus the thinking of veterinarian Cooper Curtice opened the way for control of mos-

quito-borne malaria and yellow fever, tick-borne typhus, and a host of other maladies where biting insect vectors carry the pathogen from victim to victim; a contribution that has saved untold millions of human and animal lives.

Tabourin — Pravaz

It is generally conceded that Wood, an Edinburgh physician, made the first therapeutic, hypodermic injection in 1850.

Back of this, there is some credit where credit is due for Tabourin, a veterinarian at the veterinary college in Lyon, France, paved the way for parenteral therapy (the administration of drugs by injection.)

Between 1845 and 1848, Tabourin experimented, first with nux vomica or dog button, then with other Galenicals, by inserting them through small incisions in the neck skin of horses and studying the systemic reactions.

Tabourin had a friend in Lyon, one Pravaz, a prominent physician, who soon became intimately associated with Tabourin in studying this new mode of drug administration. To expedite their studies, they fashioned a crude piston instrument with an attached sharpened tube, the forerunner of the present day hypodermic syringe. In Europe, even now, the synonym for hypodermic syringe is Pravaz syringe. Unfortunately the name of Tabourin was forgotten long ago.

Otto Stader

Since ancient times splints and heavy casts were standard procedure in handling fractures.

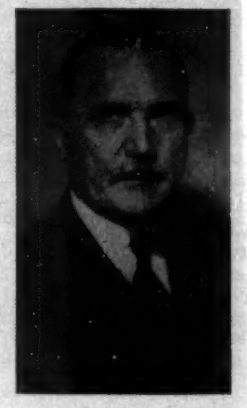
Some 20 years ago, a veterinarian, Otto Stader, then practicing at Elgin, Illinois, felt the need for some better method of handling the often complicated fractures of dogs. A man possessed of exceptional mechanical ability, he worked out an all metal device which combined bone pinning with controlled traction for holding the fractured bone ends in proper approximation. Other veterinarians were astonished and pleased to see dogs with femur fractures walking about without apparent discomfort — free from bandages — within a matter of hours after application of Stader's splint.

Otto Stader's splint proved a Godsend to suffering mankind for it soon was used widely and is still used by orthopedists in thousands of war casualties as well as in civilian hospitals throughout the world.

Karl Meyer

In the early part of the present century many housewives would not think of buying food in tin cans. Their prejudice was justified, for so-called "ptomaine poisoning" was a not infrequent tragedy.

Veterinarian Karl Meyer, for many years director of the Hooper Foundation for Medical Research, San Francisco, mastered a knowledge of lamziekte or botulism while working with the famous veterinarians Theiler and Du Toit in South Africa.



Dr. K. F. Meyer

After coming to America his epochal research on botulism paved the way for prevention of this toxin killer in both commercial and home-canned foods. This brilliant scientist also contributed a mass of original knowledge by his research on encephalomyelitis, psittacosis, leptospirosis, and bubonic plague. He too, has saved countless human lives.

Schofield

A great president and some half million other middle-aged males are stricken with coronary thrombosis annually. Deaths from this too common syndrome have been reduced a third by the use of dicumarol.

Few of these victims know that their lives may be saved because of the practical research of a brilliant Canadian veterinarian.

In 1923, Dr. Frank Schofield of the Ontario Veterinary College established that hemorrhagic deaths of cattle grazing sweet clover or fed sweet clover hay were due to presence of a blood anticoagulant factor present in this forage. It was on this basis that Link and others in Wisconsin developed the life-saving drug dicumarol — a tamed type of the sweet clover poison that kills animals.

Dunlop

Today the commerce of the world rolls on rubber to say nothing of millions of automobiles.

Few people know that a veterinarian invented and patented the first rubber tire.

In Belfast, Ireland, less than 100 years ago, Doctor Dunlop conducted a veterinary practice. His nerves became a bit ragged from the noise of his little son riding a metal-tired velocipede over the cobblestones of the hospital courtyard. With the ingenuity that so frequently characterizes practicing veterinarians, he fitted molded rubber strips over the velocipede's wheels. Pleased with the noiseless vehicle, he then placed rubber tires on the wheels of the dog cart he used in practice and invented a valve so that pneumatic tires could be fitted. Issuance of patents followed, and today the half billion dollar Dunlop Tyre Corporation of Great Britain is the fruit of this Irish veterinarian's contribution.

Many Others

If one but had time to dig and delve, there are doubtless many more boons to mankind that could be credited to veterinarians.

The nation's billion dollar turkey industry was made possible by Doctor Billings of Minnesota with his discovery that cecal worms of chickens are the intermediate host for the pathogenic amoeba of turkey blackhead.

Schmidt of Denmark's potassium iodide, and a little later, air insuffilation of the udder, cut milk fever mortality of cows from a near 100 to an approximate 5%. Later, Gregg of Scotland's postulation of hypocalcemia and parenteral calcium therapy in milk fever has saved the dairy industry millions of dollars.

The observations of Bang in Denmark on bovine contagious abortion (brucellosis) paved the way for all of our intricate knowledge of this disease in man and domestic animals.

Conclusion

The world might well remember that all human biological and pharmaceutical research is based on experimentation with animals. New surgical technics are proved on dogs before they move to the human operating table. Veterinary knowledge is altogether essential in control of the several score diseases transmissible from animals to man. All of the essential vaccines and biological products available today are based on a foundation of veterinary knowledge.

In the press and complexity of modern life we can scarcely expect the average citizen to know and appreciate the multitudinous contributions of veterinarians to the agriculture, public health, and the general welfare of mankind. But in our own ranks, we should be cognizant of our profession's historic accomplishments, that we may be dedicated even better to the tasks of the future.

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Pork Worm Disease

Trichinosis is still with us. Veterinarians should always be alert by warning home butchers of the dangers in the consumption of raw or partially cooked pork or its products. A recent report from a midwestern state indicates that ten persons that ate pork sausage during its preparation had clinical manifestations of infestation with *Trichinella spiralis*, only one was hospitalized.

Specimens of the sausage were found to be heavily infested with the cysts of the parasite. This particular pork was derived from a farm on which the hogs were grain-fed, though it was indicated that a serious rat problem existed on the premises.

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Horn Fly Control

That bane of cattlemen, especially dairymen, the so-called horn fly, (*Hematobia irritans*) is the smallest of the blood sucking flies, and approximately one-half the size of the house fly. These tiny insects feed head down, especially on the backs and shoulders of cattle, and often become entangled in the hair of the host and are difficult to dislodge. Eggs develop under fresh cow droppings in five days or more. One effective control measure is to spread farm yard manure on arable fields every two or three days, or break up deposits by dragging brush, sled, or rake over them. Hogs following cattle reduce the breeding of the horn fly. According to tests by the USDA, methoxyclor, a relatively new insecticide, closely related to DDT though less toxic to higher animals, is an effective control agent. A tablespoonful of a 50% methoxyclor powder evenly applied to the back, neck and shoulders of the animal, and rubbed into the hair is recommended during seasons when flies are numerous. A single application, in the absence of exposure to dashing rain, is said to be effective for two or three weeks.

Veterinary History Course Added to Curriculum at Michigan State College

Dr. J. F. Smithcors

Several years ago the author had some correspondence with the late President Day of Cornell University concerning the means of introducing liberalizing influences into the veterinary curriculum. Since a course on the history of veterinary medicine seemed but a remote possibility at the time, one suggestion which seemed feasible was to give some attention to the historical background of the topics covered in our courses. This proved moderately successful, but we found it difficult to achieve any continuity without going into a full-fledged history of anatomy.

Believing that the broader field of medicine might be of greater interest and value to the student, two years ago we prescribed the reading of a popular work on the history of medicine (Haggard: Devils, Drugs and Doctors, Pocket Books edition) by our first year students. While the reaction to this was generally favorable, the natural question was raised as to why the history of veterinary medicine should not be given instead. There being no suitable text available for class use, the logical alternative seemed to be to search the literature for material from which to prepare a series of lectures. It soon became apparent that considerably larger body of historical data existed than was supposed, although much searching will yet be required to fill in the gaps. The article, The Family Tree of the Veterinarian, appearing opposite is an outgrowth of our introductory lecture.

Last fall and winter a series of some 30 lectures was offered on an elective basis to the first year class, School of Veterinary Medicine, Michigan State College. The reception of the course was not only favorable, but nearly half the class also elected to do additional library research and writing. A number of students asked to have the work continued, and during the spring term we conducted a seminar based upon the papers which had been written. Thus instead of having to be pushed, the course apparently sold itself, and we had to put a limit on the time that could be devoted to it. The reaction of the school staff was such that it voted without dissent to make the course a requirement for the first year class this fall (1955). These details are related in the hope that other schools might see fit to follow suit. Scheduling difficulties might be anticipated, but in our case some impending changes made time available; we are convinced that the results are worth some effort in making room for such a course. The other obvious difficulty concerns the availability of text material. We are currently using, A Short History of Veterinary Medicine in America, by Bert W. Bierer (Michigan State University Press, 1955). Since this covers only part of the story, we have in preparation a text on the earlier history of veterinary medicine which will complement Doctor Bierer's book.

Without dwelling at length upon the values to be obtained from the study of veterinary history, we have found that it is more than just a liberal study in a technical curriculum. Perhaps because it is not labelled specifically as such, we have found the course to be an excellent introduction to the veterinary curriculum itself, and the best possible means of presenting the difficult subject of professional ethics. The stimulus to use the library is not the least of its values. For the graduate, the reading of veterinary history can not only be a fascinating diversion, but a means of reinforcing the appreciation of his own professional standing.—*J. F. Smithcors, D.V.M.*

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In the light of our present knowledge, poultry pathologists are agreed generally that of all respiratory diseases in poultry Newcastle disease, laryngo-tracheitis, and infectious bronchitis are the three dominant ones. The consensus also that the knowledge about poultry respiratory disease is far from complete.

The Family Tree Of The Veterinarian

J. F. SMITHCORS,* D.V.M., Ph.D.,
East Lansing, Michigan

Fig. 1. Egyptian herdsmen treating sick goats. From a temple carving ca. B. C. 2000. Note restraint of the animal at the right. From: Manners and Customs of the Ancient Egyptians (1841) by Sir Gardner Wilkinson.

WHILE the professional status of the veterinarian has never been better appreciated than it is today, people generally take an uncritical evaluation of his title. If there are those among us who are mildly irritated by the common tendency to use veterinary and veterinarian interchangeably, as sanctioned by Webster[1] and occasioned, perhaps, by our British heritage, or annoyed by the frequent elision of both terms, we should keep in mind that few veterinarians are aware of the full significance of the title they have earned. The reason for advocating some knowledge of the literal meaning of the term used to designate one's profession is well stated by Shipley in his Dictionary of Word Origins: "To know the origin of words is to know how men think; how they have fashioned their civilization"[2]. Probably no better illustration of this fact could be found than that offered by the term "veterinarian," for much of the history of the profession is locked up in the origin of this word and its use, or lack of use, in the centuries following its coinage.

Antiquity of Veterinary Art

The practice of veterinary medicine of some sort was undoubtedly coeval with the domestication of animals. Some of the earliest records of civilization give both written and pictorial evidence of the development of the veterinary profession side by side with that of human medicine. Ancient Babylon, Egypt, and India had special classes of persons designated as "doctors of animals", but their identification as veterinarians is of much more recent vintage. Just when this occurred is in doubt. The word "veterinary' is the English form of the Latin adjective *veterinus*. The nominative form apparently was unknown to the Romans. While it would seem likely that some term would be employed to designate those who engaged in this work, the earliest use of the term veterinarian, or its Latin equivalent, is not a matter of record. A possible explanation of this lack of a general term to denote veterinary practitioners might lie in the fact that specialization is as old as history itself. The Code of Hammurabi (ca. 2100 B.C.) refers to "doctors of oxen and asses"—horses were unknown to the Babylonians at that time, and the Kahun papyrus (ca. 1900 B.C.) mentions "doctors of fowls" in ancient Egypt. In the oldest treatises on Hindu medicine there are separate authors on elephants and on horses. In early Roman times, mules were more commonly used than horses, and the designation of *mulo-medicus* apparently antedates *equarius medicus*, either of these being more commonly employed than *veterinarius medicus*.

The Latin adjective *veterinarius*—of or pertaining to beasts of burden, is a modification of *veterinus*—of or pertaining to cattle; *bestia veterinus* is defined as any animal (beast) that works with a yoke. It should be noted that the ox was the chief draft animal of the Romans; horses, and presumably mules, were used chiefly for military purposes. Hence the veterinarian of a generation or more ago who shunned cattle practice was being untrue to the name, as well as the spirit, of his profession. There are suggestions that just as veterinary is used as a noun as well as an adjective, so the Latin *veterinarius* also may have been used in the nominative case. Stedman[3] states that the derivation of veterinary as a noun is from *veterinarius*—a cattle doctor. A precedent for this usage as a title is found in Blaine's history of veterinary medicine (1802)[4] in which he refers to "the ancient and honorable name of *veterinarius*." Concerning the origin of the term *veterinus (veterina)*, several interesting implications exist.

*Department of Anatomy, College of Veterinary Medicine, Michigan State University.

PVB.
VEGETII
VIRI ILLVSTRIS
Mulomedicina.
OPERA IOAN. SAMBVCI
BASILEÆ
PER PETRVM PERNAM
M D LXXIIII.

Fig. 2. Title page of the second edition (1574) of Vegetius (4th century), probably the first veterinary work to be printed (first ed. 1528). The title may be translated as Books of the Veterinary Art, or Digests of the Art of Curing the Diseases of Mules. Note that the use of 'mulo-medicus" antedates "equarius medicus" as the Roman designation of "veterinarian." From a copy owned by Dr. F. R. Beaudette, New Brunswick, N. J.

In his first edition (1802) Blaine says, "The ancient etymologists have it *venterina* because it is to the venter, or belly, that pack fastenings were made." In his second (1816) and later editions, this reference is deleted, hence he may have later considered this to be a case of "folk-etymology". Blaine was one of the most erudite veterinary writers of his or any age, hence his discarding of this idea has some value; no other reference to it has been found. The form of *veterinus* was given by the Latin grammarian, Flaccus (14 A.D.), as *vehere*—to draw or carry, as in vehicle. Webster gives as the probable origin of *veterinus*—of or pertaining to yearlings, thus suggesting as a cognate term, *veteranus*, from *vetus*—old, as in veteran. *Bestia veterinus* would therefore be "beasts old enough to work with a yoke." To substantiate the suggestion of a yearling, the Arabic root, *ve*—year, is considered to have contributed to the formation of *vetus*. A diminutive form of *vetus* is *vitellus*—a calf, *i.e.*, a yearling.

A further derivative of *veterinarius* is found in *veterinarium*—a hospital for sick or disabled animals of the Roman armies ordered erected by the Emperor Augustus in the second century A. D. A similar institution for soldiers was the *valetudinarium* (*valetudo*—health). While no *bona fide* Roman veterinarians are known, it is a matter of record that the Roman armies had individuals who were charged with the health of military animals; like many of the physicians in Rome, these may have been Greeks, either itinerants or slaves. The Later Roman (Byzantine) Empire is well known for its veterinary practitioners and authors, however. The first use of the term veterinary in the title of a treatise is found in the works of Vegetius (ca. 500 A.D.), Books of the Veterinary Art *(Artis Veterinariae)*.

Revival from the Dark Ages

That the veterinary art fell into decay with the passing of the Roman and Byzantine Empires is evident from the fact that the next use of the term in a book title is not found until 1522 when a Spanish veterinarian, de la Reyna, produced his Book of Veterinary. In 1528, Vegetius' work was translated and printed in Basle, Switzerland, the first time the term veterinary appeared in the title of a printed text, as well as being the first printing of any veterinary text, a noteworthy first in the field. The first appearance of the term in a book title in the English language was in the English translation of Vegetius in 1747. The term is not met again within any book title (in English) until the early 19th century when Blaine's Outlines of the Veterinary Art (1802) and Clark's Veterinary Physiology and Pathology (1806) were published in Great Britain. In his work, Blaine, like his ancient predecessor, Vegetius, deplored the lack of attention to the veterinary art and the low esteem of the veterinarian, although Sir Thomas Browne, M.D., in his famous work on Common and Vulgar Errors (1646), speaks of "common farriers" and "good veterinarians." As far as can be determined, this is the first time the term veterinarian appeared in English.

Clark's work appears to be the first work of its kind in English to be written specifically for veterinary students (in anticipation of the founding of a school in Edinburgh which did not materialize until 1823). The first professor of the Veterinary College of London, Sainbel, chose to entitle a student text, Lectures on the Elements of Farriery (1793). In America, Boardman's Dictionary of the Veterinary Art (1805) appears to be the first (although a reprint of a British work) publication bearing a professional title. Of more than 90 titles of American publications from 1775 to 1865 listed by Merillat and Campbell,[5] only seven contain the terms veterinary or veterinarian, while the terms farrier, farriery, stable directory, horse doctor, et cetera, are

met with 37 times. In commenting upon the scarcity of scientific veterinary texts in 1885, Huidekoper[6] stated, "Medical publishers hesitate to print the work of a veterinary surgeon . . . books of technical worth are only bought by the few physicians whose personal tastes interest them in animals, as a pastime or for laboratory research."

The decline of the art of veterinary medicine was already well advanced by the time of Vegetius, who was not a veterinarian, but a layman interested in the subject. Without detracting from his work, it is a sad commentary on the state of the veterinary profession of the time that he should be considered by some to be the "Father of Veterinary Medicine". By the same token, an Italian lawyer, Ruini (16th century), is indisputably considered the "Father of Veterinary Anatomy" on the basis of his original work on the horse, and the first notable writer on veterinary matters in English was a country squire, Blundeville, also of the 16th century. There is reasonable doubt that Vegetius deserves the title sometimes conferred upon him, for much of his writing appears to be influenced by, if not copied from, the Byzantine veterinarian, Apsyrtus (ca. 300 A.D.). In addition, it would seem doubtful that the work of Vegetius, in spite of its translation into several languages, had much influence upon the practice of veterinary medicine except indirectly as some of the more rational writers of the 17th and 18th centuries may have been influenced by his enlightened conservatism.

For some time prior to Vegetius the term *veterinarius* had disappeared from writings on animal disease, and in its place the term ferrer, or ferrier, later farrier, came into use. The substitution of farrier for veterinarian apparently came about in some manner such as this: The Latin *ferrarius*, from *ferrum*—iron, designated the blacksmith; the farrier thus derives his title from the metal with which he works. The Greeks did not have horseshoes, and the early Roman shoes were of silver or gold, and were tied on; needless to say, they were used only on dress occasions. While iron horseshoes were used later by the Romans, it is apparent that the *ferrarius* worked with iron long before horseshoes were invented.

The decline of interest in animal disease may well account for the almost total disappearance of the term veterinary from contemporary writings for well over a thousand years. The invention of the iron horseshoe made shoeing a necessity however, hence the need for someone to forge and apply them, and what more likely candidate would there be than the *ferrarius?* In France, the blacksmith became the ferrier; in Middle English, the ferrour, later ferrer, farrer, and finally, farrier. With an increasing part of his business becoming the shoeing of horses, it would be only natural that the smith should be the individual in the community most familiar with the diseases of horses since no one else was interested in the latter subject as a vocation. This turn of events would also explain the total lack of attention to the diseases of other animals. That veterinary medicine, after the founding

Fig. 3. The 16th century farrier as "horse-doctor." Upper left: Applying cautery. Upper right: Administering drench. Lower: Bleeding with fleam and bloodstick. Note the lack of restraint for cautery, and the dangerous expedient of tying up the head for drenching. From: The Knightly Art of Riding (1584) by Jobst Amman, as reproduced in Kulturgeschichte der Tierheilkunde (1952) by Reinhard Froehner, used by permission of Terra-Verlag, Konstanz.

of veterinary schools in the 18th and 19th centuries, should continue to be concerned principally with farriery may be explained by the fact that most veterinary writers and educators of the time had been stable masters or farriers. While the first veterinary schools in Europe, those at Lyon (1762) and Alfort (1765) in France, did pay some attention to the diseases of other animals, they were dominated by men whose interests were principally

those of horses. The Veterinary College of London (1792) was founded through the efforts of a Frenchman, Sainbel, who apparently was genuinely interested in the diseases of all animals, but upon his death a year after the school was opened, he was succeeded by a surgeon, Coleman. For 40 years only the horse was taught at the London school. Worse yet, Coleman deliberately catered to the sons of grooms and farriers to the exclusion of educated individuals as candidates; hence the graduate veterinarian in Britain was for many years considered, and logically so, as being little different from the self-educated farrier.

Nineteenth Century America

Until the establishment of veterinary schools in America in the late 19th century, most of the relatively few graduate practitioners in this country were from Britain; hence the farrier dominated the veterinary scene in America until the latter part of that century. It is difficult to assess the extent of the damage done the veterinary profession by this one man, Coleman, but it is obvious that his influence extended far beyond the confines of his 40-year tenure in Britain. Undoubtedly no small part of the reason for modern dictionaries, both standard and medical, giving blacksmith, horse-doctor, and farrier as synonyms for veterinarian can be attributed to the evil genius of Coleman. It should not be construed that the art of farriery is, or ever was, a dishonorable calling, merely that under present standards of veterinary practice, there is no longer any justification for considering that the two arts are one and the same. Webster partially clarifies the situation by stating that farrier is an obsolete term for veterinarian, but farriery is given as a synonym for the veterinary art. Something of a similar confusion exists in the minds of many as to the offices of the oculist, optometrist, and optician, but in this case the difficulty is mainly one of similarity of terminology—no one would confuse "eye-doctor" with "lens-grinder". That public appreciation of the position of the veterinarian is of relatively recent vintage is shown by the report by Merillat and Campbell[7] that during World War I, after the veterinary arm had been placed under the Medical Department, field officers persisted in calling graduate veterinary officers farriers.

While the term veterinary is of ancient vintage, and its connotation is well known today, it is a fact that the word almost completely disappeared from the English language until the late 18th century. The fourth edition of

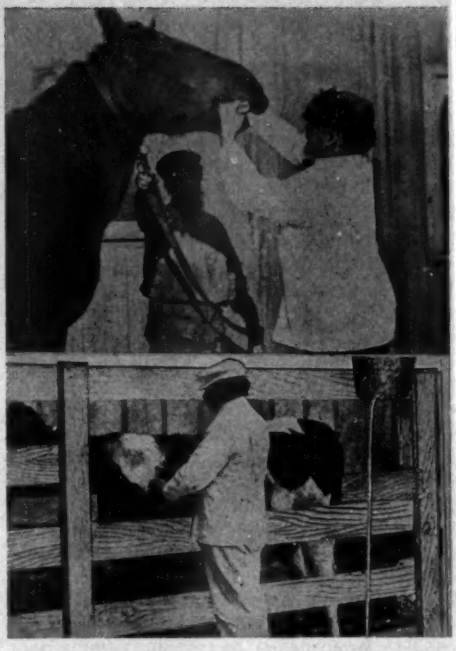

Fig. 4. The early 20th century veterinarian. Upper: Administering a bolus by hand. Lower: Hypodermic injection; flushing tank for uterine lavage. Note the change in apparel. From: The Practical Home Veterinarian (1913), used by permission of Dr. David Roberts' Veterinary Co.

the Encyclopedia Britannica (1806) was the first to carry an article on veterinary medicine, and in it the editors offered an explanation of the term since they felt the reader would be unfamiliar with it. Neither of two of the most eminent medical lexicographers of the early 19th century, Hooper (1817)[8] and Hoblyn (1835)[9], mention the term. Dunglison (1860)[10] under the entry veterinary gives as synonyms, L. *veterinarius*, and Fr. *veterinaire*. For the definition he refers to the entry, farrier, for which he merely gives the synonym, *hippiater* (Gr. *hippos*—horse; *iatros*—physician). Hippiater is defined as farrier, or horse-doctor—"used also for one who treats the diseases of other domestic animals." For veterinary art he gives farriery as a synonym, but defines the former as the art of treating the diseases of cattle, apparently basing his definition more upon the strict derivation of the term than its actual use. As mentioned above, Stedman derives veterinary as a noun from *veterinarius*—a cattle doctor. The interpretation of the word cattle presents some diffi-

culties. The term is derived from Middle English, catel, or chatel—goods or property, whence chattel. Catel in turn is from Late Latin, *capitale*—goods or property, especially cattle. In Latin and Middle English, cattle includes all forms of domestic livestock; later the horse was excluded from this classification (and certain classes of people added). The British still use cattle to denote all split-hooved domestic animals.

As indicated above, the unscientific appraisal of the term veterinarian may be traced, in part, to the actual status of the profession not so long ago. Dictionaries do not create a language; they should, however, attempt to reflect correct current usage. While the titles of earlier professional works, *e.g.*, Dadd's Modern Horse Doctor (1854) might have been improved upon, they were at least in keeping with contemporary terminology. Recent popular works with titles such as Hoss Doctor have served to perpetuate an anachronism, which although picturesque, tends to emphasize the less professional aspects of the times and events depicted. Merrillat and Campbell[17] state, "The unfavorable appraisal the name veterinarian received was laid down in the days of chaos, of quarreling, of unethical tactics, of numerical weakness, of poor colleges, of veterinary impostors, of public indifference, of lack of associations, and laws . . . " Until sufficient numbers of well trained, ethical practitioners, protected by adequate legislation began to dominate the scene in America, anyone who fancied himself a veterinarian could set himself up in practice—and usually did. Of these, Arburua[18] says:

"Many of the depraved, drunken and disreputable horse traders, anvil artists and livery stable parasites, whose principal qualifications were greed and dishonesty, decided to call themselves farriers and veterinary surgeons, often assuming that title overnight. With increase in numbers and value of livestock, their numbers increased also, not in proper proportion, however, but in leaps and bounds. The public, unaccustomed to scientific veterinary practice, fell unwittingly into the hands of these unscrupulous mountebanks whose chief stock in trade was a glib tongue and their asserted ability to cure 'hollow horn', 'wolf in the tail', 'moon eyes' . . . and a host of other ills, real or imaginary. From these the general public, ignorant as to the qualifications that a scientific doctor of animals should

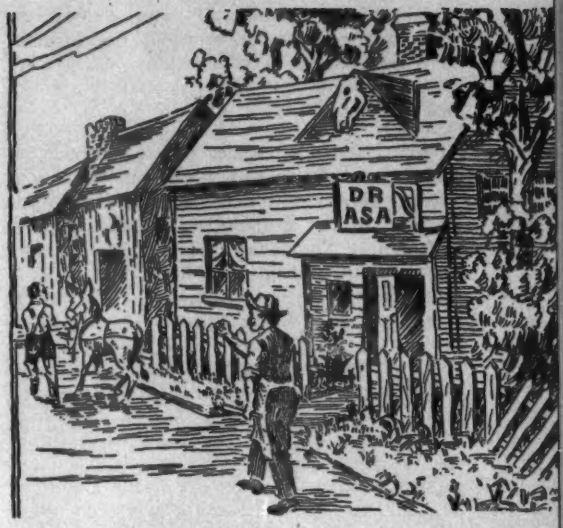

Fig. 5. The horse-doctor of the 19th century. "Doc Asa" has dismissed a client who questioned his diagnosis. Note that the farrier's leather apron is still standard apparel. From: Veterinary Military History, op. cit.

Fig. 6. The beginning of scientific veterinary medicine. Doctor Cooper Curtice examining ticks on a cow dead of Texas fever (ca. 1890). Curtice was instrumental in demonstrating the tick as a vector of the disease. From: The Infectious Disease of Domestic Animals (1944) by W. A. Hagan.

possess, began to think of them as the true representatives of the veterinary profession, that veterinarians were anything but gentlemen, and certainly were not fit to travel in ordinary social circles."

When Dr. R. S. Huidekoper, a physician as well as a veterinarian, was commissioned as a military surgeon in the Spanish-American War, he was attacked by the press and high military circles as a "horse-doctor". Concerning the matter of this attack upon him, Huidekoper[19] later wrote, "I had no cause to regret that I was, and proud of the fact that I am, a veterinarian." One of the early American veterinarians to be respected for his writings and ability in veterinary matters was Elisha Thayer, who although one of the most accomplished practitioners of his day, concealed the fact that he was a veterinarian after he had been appointed to the Massachusetts Cattle Commission in 1860. Had he and others been more willing to face the facts, it might not have been felt necessary for Merillat and Campbell[17] to write, "To a large percentage of the masses, the veterinarian of 1935 is still classified, to a certain extent, with the quack animal doctors of the otherwise forgotten past. Eighty years after Thayer hid the fact that he was a veterinarian, some, perhaps many, veterinarians are not proud of their chosen occupation."

One attempt to alter the situation was the use of the term comparative in place of veterinary. Thus at one time it was not uncommon to find departments, courses and texts of Comparative Anatomy (distinct from the zoological variety), Comparative Medicine, et cetera. A number of veterinary schools awarded the degree of D.C.M.; the designation of comparative pathologist was in common use. Today all American schools include the term veterinary in their titles and in the wording of the professional degree. In addition, most of the professional journals today employ an unmistakable veterinary designation although this was not always the case. It is of some interest to note that early in this century, the editor of The Archives (later Journal) of Comparative Medicine and Surgery made frequent use of the term animal engineer as a substitute for veterinarian. The term was apparently first suggested by Leonard Pearson[20] in his presidential address at the meeting of the American Veterinary Medical Association in 1900. Merillat and Campbell[17] mention that this term, animal engineer, was adopted by the new Spanish Republic to designate the better qualified veterinarian, suggestive of the similar use of artiste in 18th century France. It is something of a paradox that the country which had the honor of producing the first written work bearing a veterinary title in the age of printing, de la Reyna's Book of Veterinary (1522), should in modern times attempt to dissociate the profession from its hereditary title.

While no one in the profession today would claim that all of the problems facing it have been solved, the mere fact that the veterinarian has met with widespread approval of an intelligent public is proof in itself that great strides have been made. In fact it is difficult for the young veterinarian today to appreciate the struggles for recognition undergone by many veterinarians still in practice. It follows that a major responsibility of everyone entering the profession is an awareness of the obligation he has to the public and his fellow practitioners, not merely to maintain, but to further elevate the professional and social position indicated by his title of veterinarian.

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A Half Century Of Veterinary Education

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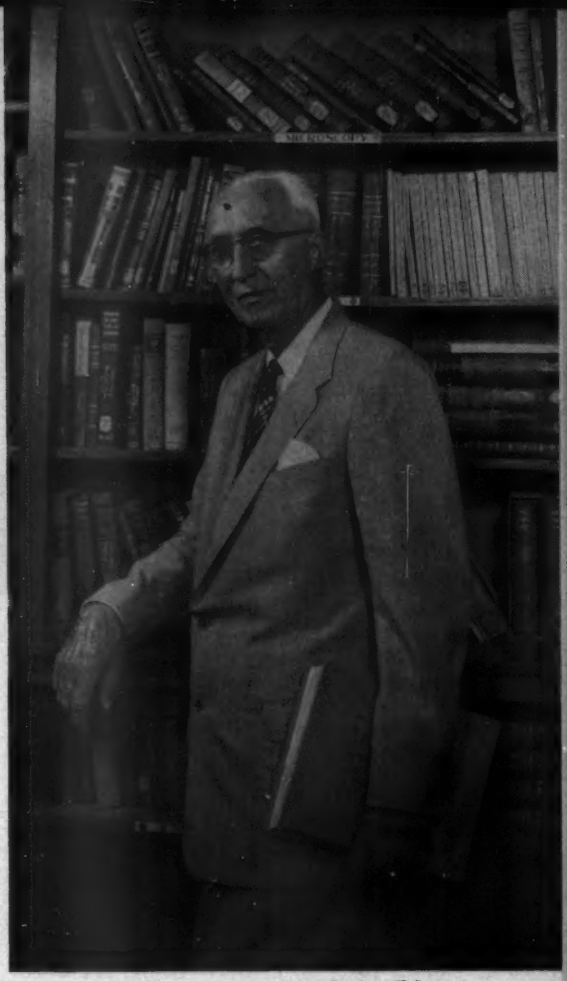
THE veterinary careers of the writer and the magazine VETERINARY MEDICINE are contemporaneous—the former graduated from Iowa State College in 1905, and the first issue of the latter, then known as the *Iowa-Nebraska Veterinary Bulletin,* was published in November 1905.

This article is largely in the nature of a reminiscence—doubtless there are errors, unintentional of course, as the human mind plays peculiar tricks, and all men do not always place the same interpretation on events.

Beginning with 1905, there were only a few states that legalized the practice of veterinary medicine, especially from the standpoint of academically trained persons. Most practitioners were non-graduates who had legal standing in many states because of registration as "existing practitioners", and renewable annually upon the payment of a registration fee. Many non-graduates, except for the lack of formal, professional training, were splendid citizens of excellent repute. Others of this group, usually with an office in a livery stable where their associates were not of the best element of the community, were contemptuously referred to as "horse doctors". Gradually the standard of veterinary medicine has risen, largely through the persistent efforts of leaders in the profession, the veterinary journals, the schools, and the ethical purveyors of products for the profession.

Evolution of Educational Facilities

In the early days of the period, and up to approximately 1920, veterinary education was largely dominated by the private veterinary colleges; that is, those receiving no financial support from state or federal sources. The private colleges looked upon as leaders of this group in the United States were the Kansas City Veterinary College, Chicago Veterinary College, and McKillip Veterinary College. In Canada the Ontario Veterinary College, later affiliated with Toronto University, attracted many students from the states. The private colleges had some excellent staffs including such men as A. T. Kinsley, Sesco Stewart, F. F. Brown, "Daddy" Moore, J. V. Lacroix, L. A. Merillat, Joseph Hughes, A. H. Baker, E. L. Quitman, M. H. McKillip and others whose names do not come to mind at this time. In most of the private colleges the courses of instruction extended over approximately three annual periods of six months



Photo—Courtesy K-Stater

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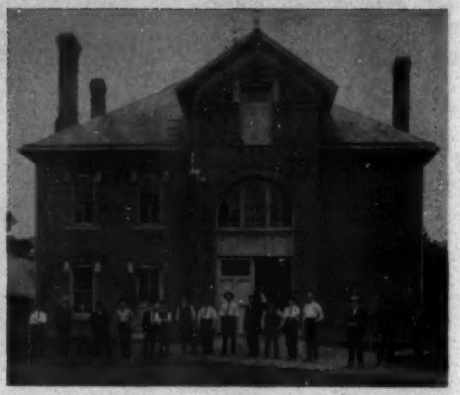


The 1905 graduation class at Iowa State College. Clinical building in use at the time in background.

each. Clinics consisted almost exclusively of equine patients because the institutions were located in large urban areas, and likewise most of the students were from the same regions. Staff members had large private practices that were also used for student instruction. In general, the equipment and teaching facilities of the private colleges outclassed the state colleges.

The state colleges of the early days: Iowa State, Michigan State, Ohio State, New York State, Pennsylvania University, Alabama Polytechnic Institute, Texas A. and M., Kansas State, Colorado A. and M. and Washington State were inadequately supported financially, their staffs small, and laboratory equipment below standard. These schools did have an advantage in veterinary training in that their clinics were derived from rural sources, and their students were mostly farm reared.

The real clash between the "private" colleges and the state colleges was largely centered in the requirements for admission, and the duration of the course of study. The private schools drew most of their students from centers where high school work was not a requirement. They needed many students to meet their financial obligations, and there was no pressure on them to lengthen the courses of study. The state schools did not need to stimulate attendance, though their entrance requirements and length of curriculums necessarily had to be the same as that of the parent institution; that is, high school graduation and approximately nine months of instruction each year. Almost 50 years ago, the state schools extended their courses of instruction to four years of nine months each. Gradually the trend was toward the state institutions. As mechanical motive power largely supplanted horses, the private schools were forced to close their academic doors, and beginning about 1920, state schools took over all formal training of veterinarians.

The administrative officers of the state schools largely responsible for the formulation of basic policies were M. Stalker and J. H. McNeil at Iowa State, James Law at New York State, Rush S. Huidekoper and Leonard Pearson at Pennsylvania University, David S. White at Ohio State, C. A. Cary at Alabama, F. S. Schoenbeber at Kansas State, George A. Glover at Colorado, Mark Frances at Texas, and S. B.

A clinic scene about 50 years ago. Rarely were animals other than horses presented for treatment.

Nelson at Washington. These men and their associates were in a virgin field for higher standards in veterinary medicine. The foundations for the future growth and development of a comparatively young profession in America must be credited to these pioneers. The writer of this sketch feels fortunate indeed in having known all these men personally, and he was impressed by their energy and sincerity of purpose.

Development of Standard Surgical Technics

Since the writer, during his active years, was particularly interested in the field of surgery, he was naturally most impressed by the leading surgeons of that day. There was W. L. Williams of Cornell with his radical operation for the relief of poll evil, his advanced technic for stripping the larnygeal ventricles for the relief of roaring, and his classical presentation to North Dakota veterinarians of a method of cryptorchid emasculation — "The testicle is never lost, it is definitely anchored in position; if the testicle is not located it's the operator who is lost", and he gave us the anatomical guides. Dr. L. A. Merillat of Chicago, a bold and brilliant surgeon, also a prolific writer, inspired all his students so that the Chicago Veterinary "grads" had universal acclaim in the

A 50-year-ago anatomy laboratory scene. Specimens were not embalmed — all dissections were made on freshly slaughtered carcasses.

field of practice as skillful operators. Doctor Merillat's three volume set on dentistry, surgical pathology and special surgery is still frequently consulted. His knowledge of French was a decided asset. John W. Adams of Pennsylvania, though probably not so well known as Williams and Merillat, was nevertheless their equal, or some claimed superior, as a surgeon. Later there came H. E. Bemis of Iowa State and Pennsylvania with his nerve blocking in dental anesthesia, and W. L. Guard of Iowa State and Ohio State — both skillful and splendid teachers.

Surgery in general was crude 50 years ago, though many surgeons were skillful. Anesthesia was seldom resorted to, and when it was employed it served primarily for demonstration, rather than from any humane instincts. Dogs were spayed without anesthesia (occasionally one was etherized); poll-evil and fistulous withers operations and dental surgery was "done in the raw"; rumenotomy in cattle differed in no respects. Occasionally cocaine hydrochloride (this was before the passage of the Harrison narcotic act) in solution was injected over a nerve trunk in an attempt to locate the exact site of a lame area, et cetera. Gradually synthetic, local anesthetics such as stovaine,® procaine (novocaine),® butyn,® and others, appeared and shortly thereafter the intravenous barbiturates. It seems to me that pentobarbital sodium was one of the first used by veterinarians and rapidly came into wide use.

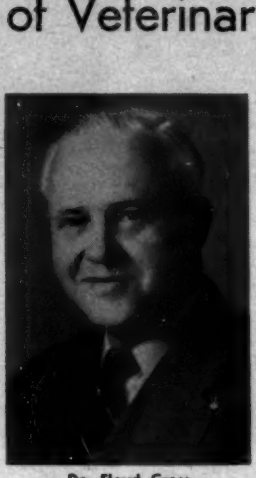
Bemis of Iowa State developed a form of dental nerve block for use on horses more than 25 years ago, and the writer first learned about blocking the cornual nerve controlling pain of dehorning from a University of Pennsylvania veterinarian. We had long owed this to the old family cow, that faithful foster mother of man. Then Benesch the Austrian from Vienna made a tour of American Veterinary Colleges and brought us so-called "caudal anesthesia" for cattle. McLeod and Frank of Kansas State in a series of brilliant anatomical and surgical projects expanded upon Benesch's method to give us the extradural or epidural anesthesia of today. Farquharson and associates of Colorado helped humane surgery by their work with paralumbar anesthesia. These fundamental studies on uncharted seas have done much for humane handling of our dumb patients. There is still room for improvement however, so that the present generation should not be satisfied with present standards.

Progress in Disease Control

Probably no activity of the profession has brought it more favorable acclaim than the practical eradication of bovine tuberculosis. Before this campaign was started there was some tuberculin testing in isolated herds (the test was the temperature method) and there was no follow-up; in other words, the owner could, if he were unscrupulous, surreptitiously dispose of reactors. Indeed, such a practice started new centers of infection. It was not until the intradermal test was finally accepted by sanitary officials that real headway was made. The writer of this article has always felt that much more credit is due Dr. D. F. Luckey for his persistent efforts to improve tuberculin testing procedures. He kept ham-

Deans of Veterinary Schools and Co

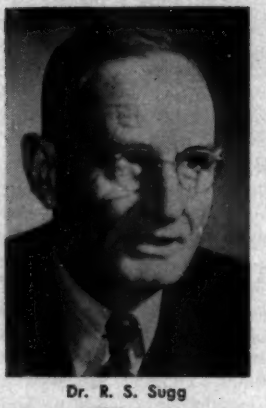
Dr. T. Lloyd Jones
Ontario, Canada



Dr. Floyd Cross
Colorado

Dr. Donald E. Jasper
California

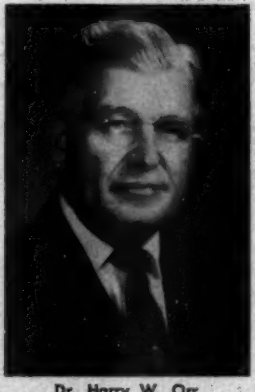
Dr. E. C. Stone
Washington



Dr. R. S. Sugg
Alabama

Dr. W. T. S. Thorp
Minnesota

Dr. W. W. Armistead
Texas



Dr. Harry W. Orr
Oklahoma

Dr. I. A. Merchant
Iowa

Co[illegible]ges in the United States and Canada

Dr. Mark W. Allam
Pennsylvania

Dr. Chester F. Clark
Michigan

Dr. W. A. Hagan
New York

Dr. E. E. Leasure
Kansas

Dr. Thomas J. Jones
Georgia

Dr. Walter R. Krill
Ohio

Dr. Theodore S. Williams
Tuskegee Institute

Dr. A. H. Groth
Missouri

Dr. Robert Graham
Illinois

mering away, by lecturing before state meetings and writing in journals, for the final adoption by state and federal authorities of the intradermal test. Without it the success of the campaign to eradicate tuberculosis would not have been possible.

Because of this contribution Doctor Luckey in 1944 received the XII International Veterinary Congress Award and a stipend of $125. Doctor Luckey was for many years State Veterinarian of Missouri and now in partial retirement resides in Tarkio, Missouri. In my opinion, it seems that because of his great service to human health, the dairy industry and incidentally the veterinary profession, Doctor Luckey should have received greater pecuniary and other recognition. It does appear that his championship of the intradermal tuberculin test is an outstanding contribution. Many of the old-timers still designate it the "Luckey Test."

The development of a method of immunizing swine against hog cholera according to the Dorset, Niles, McBride method was an epochal event about 50 years ago. It was undoubtedly the most important boon ever received by swine producers and, incidentally, the veterinarian. Previous to this development hog cholera spread like wild fire once it gained a start in a community, snuffed cut entire droves of swine and brought financial ruin to many producers.

Also shortly after this Drs. Haslam and Franklin of Kansas State resurrected blackleg aggression from the archives of European institutions. It was later followed by Goss and Scott in the development of blackleg filtrate and blackleg antiserum. These were excellent products far superior to the older spore vaccines in that the hazard of bovine blackleg was by their use rendered practically nonexistent. Blackleg bacterins came much later.

In the early days, nearly 50 years ago, a serious problem faced by practitioners was equine glanders. Many city horses in the larger centers were infected, and the farm horse in frequent trips to town became infected by rubbing noses on common hitching posts, and drinking from water troughs kindly erected by the small town citizens for use by animals belonging to their country friends. Human beings frequently became infected. The mallein test was a common technic in the practice of veterinarians, and many reactors were destroyed. The disease was not controlled until the advent of the automobile and truck, the latter displacing the city horse, and the former practically placing the farm horse in quarantine.

Future of Veterinary Practice

What of the future? The field for veterinary services will be extended greatly. We are receiving daily more and more information about the interrelationship of human and animal diseases. By his early recognition of these transmissible diseases the veterinarian will guard, or at least warn, man of dangers.

Food products intended for human consumption, especially those of animal origin, will in the future require veterinary certification of wholesomeness. On the farms, the veterinarian will be consulted more frequently to prevent animal diseases. With his specialized knowledge in the fields of animal nutrition, sanitation, genetics, biological chemistry, bacteriology, and other related sciences, he above all others can and should advise his clients how they may keep their charges in the best of health, and thereby assure profitable production and reproduction.

Immunization to protect animals against acute outbreaks will become more general, and vaccines will be greatly improved products. But as most veterinarians now realize — witness hog cholera — vaccination alone is not the answer, sanitation is important.

Genetic weaklings, and those carrying undesirable genes will be eliminated. Also from the genetic standpoint, disease resistance, parasite resistance, et cetera, will be "bred in" just as conformation, and meat and milk production and egg laying qualities are now "bred in".

Veterinarians of the future will be regularly retained for frequent and periodic examinations of livestock, and because he will have at his disposal not only more but more accurate tests, he will be able to diagnose disease in its incipiency and stop it before serious damage has been done.

The use of electrical and atomic equipment, radiation by ultraviolet and infrared light rays, and other physical and chemical aids will be on the increase. Geiger counters, radioisotopes and tracers are all in the picture of the future.

And finally, there are always possibilities that there will be developments in disease control so radically different from our present conceptions that veterinarians of 1000 years hence will laugh at our 20th century methods as those of today ridicule the methods of a few hundred years ago. This is the atomic age; the future is bright for the profession, but we will have to apply ourselves persistently to maintain a position of leadership in matters concerned with the prevention of livestock diseases and safeguarding the health of man.

Progress In Veterinary Medicine As Related To Cattle Practice

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PROGRESS in all phases of cattle practice has been phenomenal since the period of World War I, 1912-18. The divisions of veterinary medicine that deserve comment vary with the area of the world where the art and science of our profession are observed. A few important changes were made in transportation and equipment, diagnostic procedures, newer knowledge of diseases through research and publication of better journals and textbooks, in more valuable, specific, therapeutic agents and in the application of preventive medicine. It is hoped that a few detailed examples of this progress, which were a great aid to agriculture, may prove useful in the daily routine of veterinarians.

Transportation and Equipment

The improvement in farm-to-market roads was begun after World War I. This in itself was a most important aid to the veterinarian whose lot it was to get to his patients wherever they might be found. It was not until the snowplow, attached to high-powered speed wagons (trucks) came into common use that the modern automobile made country practice something of a pleasure in winter as well as in summer. Then, the development of automobiles with side curtains and finally enclosed cars with heaters, defrosters, and snow tread tires changed practice in the cold parts of the United States and Canada from a life of drudgery and dangerous exposure to an efficient and satisfactory operation. This improved service to anxious or excited clients, helped patients, suffering acute and serious diseases, and made the country practitioner an essential man and an important factor in the success of every farming community.

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In addition, the use of rubber obstetrical boots and suits, aprons or trousers, made it possible to be cleaner, neater, and more comfortable. The improved appearance of the modern practitioner pleased the most critical breeder of fine cattle. Yet, a few practitioners today prefer to go from farm to farm looking worse than a transient laborer. Fortunately, prevention of exposure of the practitioners to disease through the use of rubber obstetrical sleeves and necessary surgical gloves was initiated about 1925. No doubt many veterinarians were saved from acute hair root infection on their arms and from undue exposure to brucellosis through learning the technics of powdering their arms and wearing rubber sleeves when handling fetid and dangerous cases of metritis. Obstetrical cases and

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retained fetal membranes and placentas became much easier and more pleasant to handle. It was soon apparent that intelligent use of modern gloves with sleeves attached was not only easier and safer for the operator but pleased the most critical herdsmen or owners.

The most important factor was that the rubber protection on the arms and fingers caused much less irritation of the rectal and vaginal tracts of our patients. Today, it is standard practice in many surgical procedures on cattle to use sterilized gloves and the results are better for it.

There are innumberable pieces of equipment (so-called gadgets) that have made cattle practice more enjoyable and productive of excellent results. At the top of the list in the opinion of many obstetrists would be the inventive contribution of the Swedish and Austrian veterinarians, who made it possible for Franz Benesch to bring to Cornell and to the profession in the United States in 1926, the Universal fetatome. Many substitutes and modifications have been based on the Benesch[1] instrument and all have served their purpose well. The detorsion rod of DeMott and Roberts[2] has greatly simplified handling of torsion of the uterus.

Similarly, in this period (1920-26), John K. Bosshart,[3] practitioner at Camden, N. Y., who was doing many operations for intestinal intussusception and traumatic gastritis, became enthusiastic about a method of protecting the peritoneal cavity from contamination when doing rumenotomies for the relief of traumatic gastritis. R. H. Bardwell, and the late D. H. Udall[4] working in the Ambulatory Clinic at Cornell in 1927, introduced the embroidery hoop and rubber apron technic as an improvement that made rumenotomies safe for the patient and greatly improved the gross appearance of the operation. Many further refinements of this apron have been made in this country and in Germany in the last few years.

The Frick speculum for introducing a larger, more durable stomach tube quickly without using the painstaking procedure necessary for passing a softer, smaller tube through the nostril assisted greatly in handling digestive disturbances, including bloat.

Now Muffly[5] of Lewisburg, Pennsylvania has nearly completed his research on a tube with a magnet attached for removal of the foreign bodies from the reticulum via the stomach tube and speculum.

The magnets of Cooper[6] present a still simpler method which appears to have value since one ranch in California has magnets in 900 head of cattle and the owner and veterinarian think highly of the results in preventing traumatic gastritis.

By the same progressive spirit, many practitioners like Dr. Alan Wright,[7] have found metal detectors a useful "gadget" for locating foreign bodies and clinching the diagnosis. Especially are these useful for determining that all of the foreign bodies are out of the cow's stomach at the end of a rumenotomy. A still different and recent and practical means of determining the same fact to a lesser degree is by always placing the modern Alnico magnet into the reticulum and scraping up the loose pieces of metal and dirt containing metal after what appears to be the principal offending object has been removed.

In this connection, the instrument that is not sufficiently used in connection with the foreign body problem in cattle is the protection of ground feed and chopped hay by means of several strong magnets, 18 in. x 4 in. size. On valuable horse and cattle farms, like the farm of Rex Ellsworth at Chino, Calif., pounds of chopped wire and nails and other hardware are removed by such a series of "prevention" magnets attached to the grinding and elevating machinery. Many large breeding establishments could well afford to give all chopped and ground material such an inspection.

The use of metal uterine catheters, such as one sold in Europe as the Nielsen catheter, and ones in this country as the Woelffer and Lukens catheter, makes sterility work easier and more effective. Each of these is passed easily through the cervical canal of cows and heifers, the Lukens catheter being best for tight narrow cervices, such as in young, fat, sterile, "repeater" heifers of any breed. The infusion agents can be inserted with clean glass syringes and since the use of antibiotics is general practice in these cases, the catheters may be inserted without danger from infecting the animal whether the treatment is applied when the level of estrogen is high, as near estrum, or at other times.

The vaginal mucosa is not touched except with the sterile catheter since these, or plastic insemination tubes when they are substituted for metal catheters, are all passed in the same manner by grasping the cervix through the rectum with one hand while inserting the catheter through a properly cleansed vulva with the other hand. This is a great improvement over the use of cervical forceps and catheters with dilators forcefully applied, working through the vaginal canal and without potent antibiotics to prevent introduction of infection at time of treatment.

This is hardly sufficient upon the subject of transportation and equipment, because air travel has been used widely and successfully to make longer calls and hundreds of other highly essential bits of equipment are available and for the most part are being employed by the progressive man in the field.

Diagnosis

An illustration of a diagnostic instrument was mentioned previously in traumatic gastritis, but the careful and critical use of hematological studies is perhaps a greater aid and a much more scientific approach to the determination of which cases of traumatic gastritis are operable. Some do not need an operation either because the cow is sure to die or because there is little or no evidence of trouble. Yet, blood tests sometimes mislead and one should never fail to use the diagnostic skills that were taught by Malkmus of Hanover, Germany and by the late Doctor Udall[8] and others in America. A paper by Bosshart[9] in 1926 told about all that one needs to know in order to diagnose most cases of hardware disease. As lymphomatosis has become more common, however, one is impressed by the value of a blood examination plus physical diagnosis.

A more impressive example of the value of laboratory diagnosis is its use in the control of brucellosis and mastitis. Without the bacteriological and biological work that has been done in the control of these diseases, less progress would have been made. It is still very important, however, for the inexperienced practitioner to know how to collect essential facts and how to gather clinical data in the control of these and other diseases.

The Wright stain of a blood smear visualizing organisms of anaplasmosis is an added bit of laboratory evidence that supports clinical history and observations in routine practice.

The intense leukopenia observed in such diseases as virus diarrhea of Olafson *et al.*,[9,10] and in the early stages of other viral infections can not be overestimated as important diagnostic progress since hematology has come into more general use.

No doubt the methods of control for vibriosis, (fig. 1) developed by Gilman, Hughes, McEntee,[11,12] and others, where a suitable agglutination test on the mucus from the vaginal tampons gives the answer, are the most clear-cut advances in the control in the diseases of reproduction in late years. This plan, with a good history of the herd will determine which herd sires are infected with *Vibrio fetus* without actually observing the bulls. However, the present work with electro-ejaculation in Colorado and elsewhere may make it possible to collect sterile semen samples for *V. fetus* cultures and for a great many other studies.

The discovery and partial control of trichomoniasis was the result of Abelein[13] in Germany (1932) and Emmerson[14] at the University of Pennsylvania at Philadelphia coupling clinical diagnostic acumen with the aid of a microscope. Bartlett[15] has improved greatly the original technic for diagnosis through the use of the preputial pipette and centrifuge. Binns, Thorne,[16] and others prefer preputial douches and special cultures of the centrifuged saline washings, but both methods are advances with a very important parasitic venereal disease that probably went entirely undiagnosed for 50 years in this country. It was described

Photo courtesy Dr. Wayne Binns, Logan, Utah

Fig. 1. Vibrio fetus (electron microscope).

Fig. 2. Illustrating technic of slipping fetal membranes in the pregnant horn.

Photo courtesy Cornell Veterinarian

clinically in 1928 by Lothe[17] in Wisconsin and earlier in Switzerland, but the elusive *Trichomonas bovis* was discovered as a cause of the clinical disease later.

Diagnosis of Pregnancy

For clinicians, who spend considerable time on breeding diseases, most frequent and important is accurate pregnancy diagnosis at 30 to 45 days following service or artificial insemination. This diagnosis became 100% accurate after 38 days in the majority of females of all ages after Gustav Danelius, a practitioner of Linkoping, Sweden, taught me the technic of slipping[18] the fetal membranes (fig. 2). Later, others developed a finer technic for palpating the slightly distended pregnant horn where an amnionic vesicle is not slipped but palpated. This is done early and accurately in the hands of skillful men in this special field on the majority of cattle between 30 and 37 days. This diagnosis impresses the owner and detects some cows as positively pregnant that are found open a few days later. It is, therefore, an aid in the diagnosis of early abortion or absorption of the fetus. There is not too much proof, however, that this very early examination, if roughly done or if done at all, may not abort an occasional fetus that would otherwise not be expelled. Having used the diagnosis from 40 to 60 days with slipping of the fetal membranes upon thousands of cows and having the same done by many of my students, I consider that technic absolutely safe and invaluable when needed. It prevents the too common error of calling cows pregnant when they actually carry mucus, serous, clear exudate (mucometra - hydrometra) or pus (pyometra). This slipping-membrane technic, plus the use of modern pyrex glass vaginal specula and lights, has made the accurate detection of estrum possible in cows. Formerly the cows in heat had too often been called abnormal cows, cystic ovary cases, endometritis, or pregnant when simply in estrum.

In this field of reproduction, advances that have been made are numerous and include the diagnostic technic for the use of a peritoneoscope as developed by Dr. Francisco Megale at Cornell in 1955[19]. By inserting this instrument through a small, temporary or permanent fistula in one or both flanks, it is possible to observe ovulation, the health of the ovarian bursa and oviduct in an interesting and perhaps very practical manner. The development of this technic, suggested by Doctor McEntee of Cornell in 1955, could lead to important studies in hormone dosage and therapy.

The free use of a laparotomy with improved surgical asepsis and the protective action of antibiotics makes possible the diagnosis of such rare diseases as a displaced abomasum or even torsions of the abomasum, an unheard of problem until recent years. This and many other diseases must be differentiated from acetonemia, and the laparotomy and treatment confirms the diagnosis as described by Moore[20] (1954), and other problems with the abomasum discussed by Fox[21].

The field of better diagnosis is the one where the large animal practitioner should be most active and interested. He is working diligently to prove to clients that antibiotics will not solve all problems. *X*-ray diagnosis could be added in the future as an important

aid in this field as better equipment comes into more common use at hospital centers. Emmerson[32] has already gone a long way with the *x*-ray in the early diagnosis of dwarfism in beef calves by *x*-ray study of the lumbar vertebrae.

New Information on Disease Problems

Perhaps the part that is most difficult for those of us who teach or practice is to learn about new and outstanding disease problems as fast as this knowledge is presented at meetings or recorded in literature. Unfortunately, much of this information reaches the agricultural journals before it reaches the most conscientious reader and student among large animal or general practitioners.

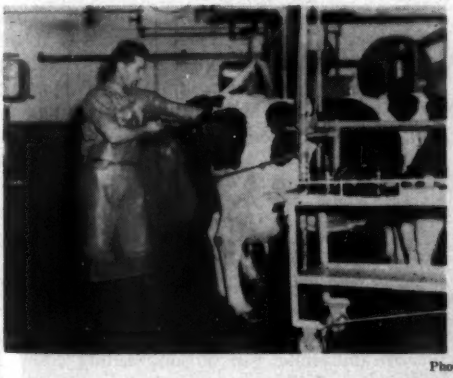
The current veterinary journals in this country, England, Africa, New Zealand, and Australia are filled with more new information in English, now, than they were 40 years ago and with much more useable material than they ever were before. Those who have developed these journals would be the first to admit that they have improved in the presentation of the results of research, but that the brief type of practical discussion that guides the every day activity of a practitioner has become submerged at times in this sea of new information on poultry and other important animal life.

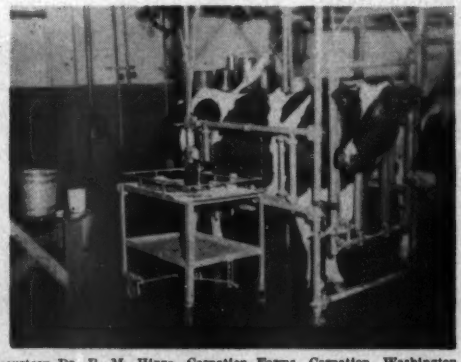
The agricultural research journals are pouring out new facts, especially on artificial insemination, frozen semen, and on the physiology and pathology of reproduction, faster than most practitioners can classify it or use it.

For example, all clinicians should be aware of the interesting fact that antibiotics added to raw semen prevents vibriosis when infected bulls are used. The addition of glycerin, however, to permit the use of frozen semen reactivates the *V. fetus* organisms and actual instances of frozen semen causing infection in virgin heifers are recorded.

On the contrary it is interesting to note that at least one recognized worker (Joyner)[18] has shown that the addition of glycerol and deep freezing of diluted semen will eliminate *Trichomonas bovis* from an infected sample of semen. Other workers have reported unofficially that the trichomonads had survived freezing[19]. At any rate, artificial breeding has as one of its greatest advantages the fact that it enables any breeder to control trichomoniasis more rapidly, even without glycerin and freezing.

An attempt to assist busy veterinarians who are trying to keep up with new discoveries and at the same time make 20 large animal calls, six or seven days per week, has been made by abstracts appearing in professional journals having national distribution. But the farm papers usually are able to boil this mass of information down to a point where the well-informed agriculturist has an incomplete speaking knowledge of the ring test in brucellosis control, the latest antibiotics for uterine infusions,[20,24,25] and many other specific details before veterinary research people are positive as to what is fact and what deserves further study. Perhaps a weekly "Readers Digest" of pertinent data should be handed to each practitioner *gratis* by a state and federal reading board.





Photos courtesy Dr. P. M. Hinze, Carnation Farms, Carnation, Washington

Fig. 3. Dr. P. M. Hinze demonstrating technic for intrauterine therapy by cervical fixation via the rectum (L). Note appropriate clothing. Stocks designed for control of animals for examination for pregnancy or treatment of the genital tract facilitate these operations.

In lieu of this, however, we do have much better textbooks today than were available during my student days of 1916-1920. Information on such subjects as physiology,[26] immunity, and pathogenic bacteriology,[27] diseases of reproduction,[28,29] the practice of veterinary medicine,[6] pathology,[30] and pharmacology and therapeutics,[31,32,33,34] are but a few fields in which facts are much more accurate, concise, and useable than in the past. Authors on these and other subjects and on additions to the current literature have formed the scientific basis for the advancement that has occurred and will be bound to follow. The part played by well-written, unbiased opinions expressed though trade journals has improved to a point where such material is valuable.

The annual proceedings book of the A.V.-M.A. and the record of all papers presented at the various international veterinary congresses and the Livestock Sanitary Association offer unusually valuable material for teachers, students, and all veterinarians who are interested in keeping themselves informed.

The International Veterinary Congress Procedings for 1953[35] point out a method of control of bovine mastitis which is based on essentially three things. These are the Camp test (1947) by Murphy,[36] the physical examination of each cow as outlined by Udall and Johnson (1929),[37] and the careful study of the part played by improperly operated milking machines. The last named is the newest approach in this country and dairymen fully recognize the importance of the use of this knowledge of the way to detect damage to the udders of cattle. Finding out what is wrong with the functioning of milking machines, especially with pipeline milkers, is important in mastitis studies. The veterinary profession has grasped this idea to the extent that about 300 veterinarians in the northeastern part of the United States have assisted in the control of bovine mastitis by the combined attack with cultures, physical examination of the udder and teat ends, and an examination of machines. While great advances have been achieved in the treatment of bovine mastitis, research in many herds indicates that mastitis is seldom controllable by udder infusion alone with no detailed plan for control of the environmental factors.

Specific Therapeutic Agents

It is difficult for those who have not practiced for many years in the absence of highly specific drugs, such as the antibiotics and sulfonamides, to realize how fortunate is the modern practitioner. The treatment of simple diseases, such as pneumonia, was attempted in years gone by, with bacterins and sera that were far from specific. These were formerly employed with functionless drugs, such as intramuscular camphorated oil and the oral use of stimulants. A great discovery and a boon for clinicians occurred when it was shown that such secondary agents in the cause of death in pneumonia, as Gram-negative and Gram-positive bacteria (streptococci, pasteurella, coliforms, and staphylococci), were inhibited by appropriately large doses of sulfamerazine and to a slightly lesser extent by other sulfonamides. The death rate dropped markedly, and in some bad outbreaks of so-called shipping fever pneumonia (hemorrhagic septicemia) no deaths occurred when the handling of the outbreaks was confined to the oral use of these chemotherapeutic agents. Part of this great success was due to the fact that many veterinarians stopped the illogical procedure of injecting the resistance-lowering bacterins of various kinds when animals were already febrile.

It was not long until the intravenous use of sulfonamides was found to give slightly more rapid and desirable results in several septicemic conditions including pneumonia. The phenomenal specific effect of sulfapyridine intravenously in uncomplicated, interdigital necrosis (fouls) or necrotic stomatitis and laryngitis, where the etiological agent was probably *Spherophorus necrophorus* (old fusiformis) or (*actinomyces necrophorus*), made it difficult to buy sufficient amounts of this particular drug in this country. A scarcity was created as this was about the only thing for which it was still produced. Regrettably it is now observed in some areas, where this specific treatment has been used successfully for years, that it no longer works. It obviously never worked if foreign bodies or bad complications affecting the hooves, joints, and tendon sheaths existed. Yet, the general effect of sulfonamides, plus their use locally, is one of the outstanding therapeutic advances of the past half century.

When small doses, 25,000 units, of penicillin in distilled water were available at a rather high cost, it was thought to be 100% effective in freeing udders of *Streptococcus agalactiae*. Later it was learned that larger doses in oil were more satisfactory and that the intramuscular use of long acting, slowly absorbed penicillin in extremely large doses[38,39] also would free the udder of streptococci without udder infusions. Oil in water emulsions

soon replaced all other vehicles.

The wide use, intramuscularly, of penicillin in calf pneumonia, and septic conditions, such as those previously covered by sulfonamides alone, testified to the miraculous effect of this therapy. It provided a tool which even the "hired hands" could and have used effectively.

But like all advances in the field of pharmacology and therapeutics, it soon was obvious that certain cases failed to respond unless streptomycin was combined with penicillin. The use of this antibiotic alone was highly effective orally or intramuscularly in some forms of calf scours with septicemia. The wide spectrum antibiotics are more popular with some workers than the combination of penicillin and streptomycin and are practically a part of the diet of all younger calves on many large farms.

This widespread use of antibiotic feed formulae, which included such agents as B_{12} and terramycin® or aureomycin,® has unquestionably reduced the losses from pneumonia and from digestive disturbances evidenced by diarrhea in animals under three months of age better than anything previously tried. Yet, there is always the threat that the owners will become careless regarding hygiene and that forms and strains of these benign infections may develop that are drug fast and uncontrollable. In fact, it appears that the new problem in cattle[40] in California referred to as "acute upper respiratory infection," while it may be due to a new viral agent,[41] is essentially not responsive to ordinary antibiotics or sulfonamides. Perhaps agents effective against viruses will be available in the future. At the present time liberal use of citrated or whole blood has wide use, and probably is effective in some early viral infections, as well as in anaplasmosis, sweet clover poisoning, septic conditions, and early calf septicemia. Vacuum flasks for rapid collection of cleaner blood have made transfusions less time consuming.

Dryerre and Greig not only made history in their discovery of the cause and cure of postpartum paresis but popularized an agent that is specific for certain forms of indigestion, bloody milk, and anaphylactoid reactions. Yet, it is necessary to give a word of caution regarding the fatal effects of calcium gluconate when given rapidly per vein to cows with septicemia and myocarditis.

The late C. E. Hayden and his associates found two things that form a part of every veterinarian's daily routine. They found that 20% calcium gluconate in 4% boric acid in sterile water was nonirritating when given subcutaneously and that it killed few sick cows when given intravenously in dosages of 500-1500 cc. Their next discovery was that a simple urine test, Rothera's modification of the Ross test, would tell approximately what the ketone blood level was in cows suspected of acetonemia. They further suggested dextrose to overcome this hypoglycemia. Dextrose has been found to be the best single specific for uncomplicated mild acetonemia, especially if one has the courage to attempt to give it by the continuous drip technic of Roberts. In addition, dextrose is used effectively and widely in septicemia or in any conditions where dehydration and intoxication are suspected. The reduction of the percent from 50 to 5 or 10 by additional physiological saline has been found to make it more useful than stronger solutions in many conditions, such as hemorrhagic gastroenteritis.

Undoubtedly, time will prove that cortisone and adrenocorticotropic hormone (ACTH) in their various forms are almost sufficiently specific in acetonemia and in septic conditions

Fig. 4. A practical set-up for the examination of a patient for pregnancy or infertility. Every possible effort should be made to facilitate cleanliness.

Fig. 5. Proper stabling of animals in sanitary barns is a husbandry practice emphasized in mastitis control programs.

to warrant more general use. They are still expensive and do not completely solve many problems in the field of cattle practice. The incurable cases of mastitis, metritis, and ketosis may be put in the curable group if repeated use of this group of hormones is combined with the other well-known treatments.

In connection with ketosis the discovery that cobalt nourishes rumen bacteria and, therefore, stimulates the B complex producing group of bacteria, is an aid in handling the ketosis problem, because it increases appetite.

Chloral hydrate, like the milk fever outfit, is something that is still useful after 100 years. Chloral is able to raise the blood sugar in acetonemia, and the milk fever outfit, properly used, plays an important role in the otherwise fatal milk fever complex.

Formerly, the treatment of allergic reactions was confined to those cases where some antisera or foreign protein has been injected and results were fair with 5 to 10 cc. of adrenalin. At present, we know that many cases of pulmonary emphysema and/or edema are due to some unknown agent in lush grass, such as aftergrowth; and that "fog fever" or so-called grass poisoning and many other forms of allergic reactions cause serious morbidity and death in cattle.

The treatment of such cases, regardless of what the cause may be, still must include the use of adrenalin, but results are greatly improved if 400 mg. of a good antihistamine are injected intravenously or intramuscularly and repeated several times at four- to 12- hour intervals. Then, one of the old drugs that seems to be highly essential is the subcutaneous injection of ¼ to ½ gr. of atropine at two- to four- hour intervals if required. Pulmonary emphysema of unknown origin, that formerly was fatal or developed into a debilitating chronic pneumonia, can be prevented in these cases that appear to be allergic conditions by supplementing the three agents previously mentioned with administration of selected sulfonamides or antibiotics.

There are endless lists of old and new chemicals and drugs that have made practice more successful, but intelligent owners of livestock are interested primarily in preventive measures that work effectively under all conditions.

Preventive Medicine

The two best examples of the progress of disease eradication through prevention are known to every farm boy. The intelligent use of the tuberculin test has all but completely eliminated bovine tuberculosis from the United States and Canada as well as from several other cattle raising areas of the world. It was not the tuberculin alone but good hygiene and good enforcement of clean-up measures. The strain 19 vaccine of Buck and Cotton was essential in order to make the agglutination test for brucellosis a safe preventive test. We should live to see vast areas completely void of all reservoirs of Brucella.

The prevention of such scourges as scabies or real mange in cattle seems to defy our ability to apply preventive medicine. The application of benzene hexachloride prevents

serious outbreaks of mange or pediculosis in cattle if used according to modern directives on all herds.

Such scourges as liver fluke disease still defy control even with the added discovery that ants, snails and ground hogs all play their part in the life cycle. This and the better control of many parasitic diseases is a challenge to those who believe in preventive medicine. These widespread diseases deserve careful research. Nutrition studies and selection of plans still not worked out in detail for using worm remedies, where and when needed, may offer great hope.

Several developments are probable and are highly desirable within the next half century or less. One of these would be better preventive vaccine for all diseases in animals caused by viruses. Perhaps the avianized rabies virus is an example of one such vaccine that has been perfected. Our record is so bad with rabies that it will undoubtedly remain a serious problem in foxes, vampire bats, and cattle for many years. This, then, makes it desirable to have available for practitioners a vaccine for cattle that is cheap and that will produce a lifetime immunity in cattle.

It is hoped that a single injection of rabies vaccine may have been perfected for use on man. This is especially needed when the cattle population over large areas becomes infected from foxes through most of the year. The practitioner and all of the students or other assistants either have to go by the rule of always wearing long rubber gloves when around the heads of such cattle or of not examining or medicating many. Otherwise they are continuously exposed and worried.

For many of the other viral agents which cause such conditions as mucosal disease, virus diarrhea, and a suspected but unidentified virus abortion in cattle there are no immunizing agents. Perhaps none are needed because there is a tendency for entire populations of cattle to develop an acquired immunity without showing recognizable symptoms.

The classification and diagnosis by any reasonable clinico-laboratory procedure of many of our virus diseases of cattle is a fertile field for study. Several places including the Virus Institute at the New York State Veterinary College of Cornell have labored successfully with these and closely related problems. Such work has high priority on the needs for the future of cattle practice.

Summary

In this hasty manner, an effort has been made to give examples at random of useful accomplishments in a period of a few years. No doubt much more could be recorded that would guide the inexperienced, but detailed papers are available to do this. Some of the problems for the future clinician and researcher have been mentioned.

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The Challenge Of Parasitism In Farm Animals

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PARASITES are of serious and increasing concern to the livestock industry. Recent developments have contributed greatly to an understanding and wholesome awareness of the nature and gravity of parasitism. They have also demonstrated the significance and essentially universal need of parasite control in profitable livestock production. Nevertheless, they have revealed to producers, veterinarians and research workers alike the limitations of current knowledge and of available means of checking the economic losses caused by parasites.

In spite of the unsurpassed and unprecedented welfare of our livestock industry, every producer knows that livestock farming is a complex, hazardous business; that, despite satisfactions and rewards, the endeavor can be disastrous in countless ways if there is inadequacy, complacency, or carelessness. In the total picture, parasites are probably but a minor part, yet the producer knows also that animal production suffers great preventable loss caused by parasites — an aggregate loss in this country conservatively in excess of a billion dollars annually — and one that is about equally due to internal and external species. Moreover, the urgency of minimizing this loss as a measure of national welfare is a part of the challenge since experts have forewarned of the necessity of greatly augmenting agricultural production in order that an increasing population may continue to enjoy the foods and other agricultural commodities that we enjoy today.

The loss that is suffered and the urgency of reducing it are not more challenging than the underlying, largely unsolved problems of parasitism. Unfortunately, these are imperfectly understood and even the obvious ones lack recognition, definition, and exposition. The specificity of parasites to their hosts, although a basic and useful concept, has blinded us to the apparently equally basic fact that immature parasites are less host-specific. We have thought some about the injuriousness of adult parasites to the classes of animals normally parasitized by them (although, even in this area, we are just beginning to define specifically the effects of parasites such as mites, lice, keds, trichostrongyles, lungworms, liverflukes, Nematodirus, coccidia, Trichomonas and others), but we have given little thought to the larval phase of parasitic disease, "non-specific" parasitism, subclinical parasitism, or even the sequellae and bizarre effects of parasites that are in or on their "normal" hosts. It is now known from revelations about cerebrospinal nematodiasis, visceral larva migrans, and the serious effects in cattle of larvae of swine ascarids, as well as from other studies, that the infective stages of parasites are a source of potentially serious disease in "abnormal" hosts. The concept of species appears likewise to have obscured the recognition and significance of "strains" of the same species in two or more classes of animals. There is evidence that such strains may be comparatively host-specific and physiologically distinct, which is at once the rationale of their existence and of control measures. The fact that young animals commonly derive their damaging parasites from comparatively healthy, but parasitized, mature stock may have caused us to overlook the possible influence of the latter as buffers against parasitic disease in young animals. These are illustrative of fundamental aspects of parasitism about which almost nothing is known.

A definition of problems is scarcely the errand of this report. Rather, it is our thesis that only a fullness of knowledge about parasites can make possible their efficient control. Let it be witnessed that no iota of basic information was wasted in developing a simple, feasible program for the eradication of fever ticks and cattle fever.

Parasites occur in and on animals of all classes and ages, during all seasons, and in all parts of the country. Some are common and abundant; some rare. Few animals are entirely free of them internally, and few escape attack by insects and allied external pests that cause and carry disease. Parasites cause some

Dr. A. O. Foster

of the worst diseases of livestock, yet the major losses stem from an unspectacular undermining of the health of food animals and condemnations of parts and carcasses under federal and other meat inspection procedures. In short, parasites are more than occasional pathogens; they are important mainly because of their insidiousness and ubiquity, abundance and diversity.

What is known about the kinds, distribution, occurrence, and indicated measures against protozoan, helminthic, and arthropod species, as well as specific losses caused by the several kinds, have been reviewed in recent publications. What is not known about these and innumerable other aspects, however, has received so little attention as to foster the dangerous impression of security in our present knowledge. We may rightly gauge our security and present position by the shattering impact of new knowledge upon them. It is on this account that problems of livestock parasitology have grown immeasurably more challenging with the accelerated researches of the last few years — researches that have completely reoriented us to the issues of veterinary parasitology, and have all but revolutionized standards of production, feed conversion, and performance. Incidentally, the influence of parasitism on such "standards" further illustrates obvious problems that are wanting for solution. Incidentally also, these are eminently practical problems yet they demand the highest acumen of our research scientists, which is at least food for thought to protagonists of so-called basic research.

Finally, what has been our approach to parasite control and how successful have we been in it? Any answer is subjective and probably controversial, yet it can scarcely be denied that we have relied most heavily upon the use and development of antiparasitic chemicals. These are unquestionably our most powerful weapons, but even in this approach we have largely neglected the true scientific approach. Nothing fundamental has been learned about the mechanism of action of antiparasitic agents, the relationships between parasite metabolism and drug action, or the detoxication and pharmacology of these chemicals. A few workers have emphasized the irrefutable fact that a knowledge of the principles and mode of drug action is the only scientific basis on which to build and that such knowledge, in the long run, is the only certain assurance of successfully guided thinking and effort. Moreover, this approach would not have won, single-handedly, the war against cattle fever.

Regarding our success, one encounters in the anthelmintic area innumerable parasitic conditions for which no drugs are available, as well as grave deficiencies and inadequacies in the best of chemical agents and measures. There are no treatments of any kind against some 90 of about 145 species of helminths that are known to be of more or less economic importance in food animals. In the instance of phenothiazine, which is the outstanding anthelmintic of all time, there has been no adequate determination of the most efficient physical forms of the chemical; of its tolerance by the several classes of livestock; of pharmacological actions; of the spectrum of antiparasitic action, remote and long-term effects, or net economic advantages of systems of low-level and free-choice administration. Moreover, the virtues of phenothiazine have lulled us into a position of false security. This drug does not remove or control all worms and it is therapeutically ineffective in animals whose digestive function is seriously impaired. It is little wonder that there is concern over practical failures of phenothiazine when one considers the wide and almost exclusive reliance on it as a panacea for all gastrointestinal parasitism.

The antiparasitic situation in the areas of protozoan and arthropod parasites is only comparatively somewhat better. The enormous gaps between what we have in efficient

drugs and what we need, and between what we know about them and what we need to know, are as conspicuous in one field as another.

There is great challenge in the opportunities that obtain for productive, basic researches on the physiological processes and metabolic needs peculiar to the parasitic mode of life, on the fundamental, pathobiological relationships between parasites and their hosts, and on all the innumerable, diverse and ubiquitous aspects of parasitism, including the development of new, improved and "polyvalent" antiparasitic chemicals and better ways of using them. When we have the requisite knowledge about parasites, we shall then be in a position to combat effectively the depredations of these marauders of farm animals. Meanwhile, there is a special challenge to veterinarians and producers. It is one of vigilance against parasites to the end that the best available measures may be preventively and widely used to minimize loss.

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Respiratory diseases continue to be the most perplexing and costly of disease problems facing the poultry industry.

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Progress as Related to Cattle Practice

(*Continued from page 545*)

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Developments In Avian Pathology With Emphasis On Avian Practice

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Early History

FIFTY years ago a veterinary practitioner who professed an interest in poultry was hard to find and he probably did not expect to add to his income by advice or aid given on poultry disease problems. The situation has changed in the past half-century, but the opportunities which exist are still greater than the interest shown. It is equally true that the poultryman of 50 years ago seldom asked his local veterinarian for help in solving his problems. The poultry industry now recognizes that the veterinary profession plays an integral part in its economy. This change has been due to the untiring efforts of a number of individuals and agencies including the veterinary press which has been publishing an increasing number of articles on all phases of poultry research. National organizations such as the American Veterinary Medical Association, the United States Livestock Sanitary Association and Poultry Science Association, as well as their local counterpart organizations, have played major roles in convincing both the veterinarian and the poultryman that they have mutual problems and interests. The USDA, Bureau of Animal Industry (ARS), the agricultural experiment stations and veterinary schools also have done much to show both the poultryman and the veterinarian that the poultry industry needs the services of the veterinary profession.

Although few practitioners were concerned with poultry disease problems 50 years ago, there were a number of veterinary scientists who already had made outstanding contributions to this field. Names of American scientists associated with early developments in poultry disease research include many who were responsible also for the early advances in other animal disease research. Familiar names are Theobald Smith, D. E. Salmon, V. A. Moore, Samuel Cushman, Cooper Curtice, J. R. Mohler, A. R. Ward, and Leo F. Rettger.

Many of the diseases now known as causes of mortality in poultry were recognized previous to 1905, but much of our present-day knowledge has come from basic research since then. Examples of information on poultry diseases available to the public in the era before 1905 are: A general bulletin, Infectious Diseases of Poultry by Theobald Smith published in 1895; a bulletin on fowl typhoid published in Rhode Island in 1902 by Cooper Curtice; a report on avian tuberculosis in Oregon by Pernot in 1900; a bulletin on fowl cholera and another on avian tuberculosis published in California in 1904 by A. R. Ward; and a number of reports on histomoniasis published from 1893 to 1900 by Cushman, Smith, and Moore. Theobald Smith first accurately described the causative agent of histomoniasis (blackhead, infectious enterohepatitis) of turkeys in 1895. The first published report on fowl cholera in the United States was made in 1880 by Salmon. This is the same year that Pasteur reported his famous research on the successful use of an attenuated strain of the fowl cholera organism for immunization against the disease.

Progress 1905-1920

The above remarks are intended to emphasize that a great deal of background for future research in poultry diseases had been laid previous to the initial publication in 1905 of the *Iowa-Nebraska Veterinary Bulletin*, the forerunner of VETERINARY MEDICINE. A new era in research in this field was underway, however, at that time, as is indicated by the fact that a number of experiment stations had established formal projects on poultry diseases. Men who were devoting considerable time on poultry disease control during the period 1905-1910 include A. R. Ward, California; W. B. Mack, Nevada; Cooper Curtice and P. B. Hadley, Rhode Island; Raymond Pearl, Maine; and Leo F. Rettger, Connecticut. It was during this period that Rettger demonstrated that pullorum disease (then known as bacillary white diarrhea, or BWD) is transmitted through eggs laid by carriers. Raymond Pearl,

with F. M. Surface and M. R. Curtis of the Main Agricultural Experiment Station published, in 1911, a 216-page experiment station bulletin on diseases of poultry which seven years later was revised and published as a text book.

Beginning about 1910, poultry disease research was developing into a specialty and by 1920 many of the names which have become famous because of their contributions were appearing in the literature with increased frequency. Included is L. D. Bushnell of Kansas State College, who later trained several well-known specialists who are still active. A man who contributed considerable to the practical control of poultry diseases is the late Dr. B. F. Kaupp. His book on poultry diseases first appeared about 1914.

It was during this decade that Dr. F. S. Jones (1913) described the macroscopic agglutination test for detecting carriers of pullorum disease. The early applications of this test made by Rettger in Connecticut and Gage in Massachusetts did much to make possible the pullorum disease eradication program which is now being so effectively carried out by the National Poultry and Turkey Improvement Plans.

Drs. L. Van Es and A. F. Schalk began their classic series of bulletins and articles on avian tuberculosis with a report on this disease in North Dakota in 1914. Dr. Van Es in research at the University of Nebraska 20 years later showed conclusively that, to eradicate tuberculosis from swine, it must be first eradicated from chickens.

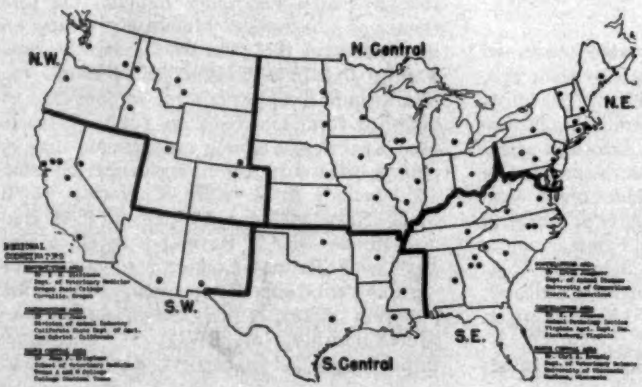
In 1920, Dr. E. E. Tyzzer of Harvard University made an outstanding contribution when he described the causative agent of histomoniasis and renamed it *Histomonas meleagridis*. In the same year, Graybill and Smith at Rockefeller Institute showed that the cecal worm, *Heterakis gallinae*, common to both chickens and turkeys, was the carrier of *Histomonas meleagridis*. These research accomplishments made it possible to later develop sound managerial technics for prevention and control of this important disease of turkeys.

Men who entered the field of poultry disease research towards the end of the decade ending in 1920 and in the early 1920's include Drs. J. R. Beach, F. R. Beaudette, H. J. Stafseth, H. Bunyea, W. T. Johnson, E. L. Stubbs, L. P. Doyle, E. L. Brunett, W. R. Hinshaw, C. A. Brandly, and E. P. Johnson. No attempt will be made to give the large numbers of persons who entered this field after the early 1920's but their contributions have added equally to the vast knowledge now available to practitioners. The text book published by Drs. A. R. Ward and B. A. Gallagher in 1917 and revised in 1922 was a standard reference for many years.

Progress 1920-1955

The period since 1920 has seen an astounding yearly increase in emphasis on research in poultry diseases, as well as in all phases of the poultry industry. In 1920, few of the state colleges, universities and experiment stations had even one person devoting his time to poultry disease research. In contrast, the majority now have from one to several persons devoting full time to some phase of poultry disease control or research.

A service both to veterinarians and poultrymen which has become popular is that of a centralized diagnostic laboratory supported by agricultural experiment stations, veterinary schools, by state and/or county livestock control agencies. Three of the earliest of these were started from about 1917 to 1920 at Kansas State College; at University of Cali-



Locations of poultry diagnostic laboratories in the six regions of the United States. From—Foreign Animal Diseases, U.S.L.S.A., 1954.

fornia in Petaluma; and at Western Washington Experiment Station in Puyallup. In a survey recently completed by the USDA, a list of 93 poultry diagnostic laboratories supported by state funds was compiled. In California, there are now eight such laboratories. These laboratories are generally well equipped and staffed by trained personnel. A need for improvement in diagnostic facilities is however indicated by the USDA survey. It revealed that less than 20% of the 93 laboratories listed, are sufficiently staffed and equipped for special diagnosis of foreign and domestic diseases requiring special technics. This survey did not include the private practitioner owned diagnostic laboratories. It is estimated that in Iowa there are some 70 practitioners who devote some time to avian practice and have limited diagnostic facilities.

It would be impossible to review all the accomplishments in poultry research made in the past 35 years. Volumes have been written and veterinary journals have been publishing papers related to all phases of the industry. *Poultry Science*, the official publication of Poultry Science Association, has had to increase its number of pages per issue frequently to keep up with the manuscripts submitted. Many of the scientific biological journals also devote much time to poultry subjects. In 1920, very few of the veterinary schools offered courses in poultry husbandry and poultry diseases to veterinary students. Now all of them require both.

An outstanding advancement in support of poultry disease research was the establishment, in 1939, of a Regional Poultry Research Laboratory at East Lansing, Mich. This laboratory, operated by the USDA in cooperation with several experiment stations, has made some outstanding advances in our knowledge of the avian leucosis complex, one of the most costly of poultry diseases. Regional cooperative research on other diseases supported by federal funds is now accepted as the most effective and economical method of solving future poultry disease problems. Examples of other poultry diseases that are being studied by this method are Newcastle disease and chronic respiratory disease (CRD). The latest cooperative regional project to be sponsored by the USDA is one on ornithosis of turkeys.

The Poultry Industry Needs Avian Practitioners

The poultry industry has become one of the largest of the agricultural industries. It has grown both in value and in numbers of birds and is now considered to be valued at nearly $2,000,000,000. It is estimated that the total losses from poultry disease in the U. S. exceeds $300,000,000. annually. These values emphasize the need of the poultry industry for adequate help in handling its health problems. Although practicing veterinarians have been showing increased interest in the health of poultry flocks in their communities, many areas are without help. Practitioners have been prone to blame the lack of interest of poultrymen to utilize their services because too much free service is given by federal, state and county agencies, feed concerns, hatcheries, and remedy salesmen. This is partly true but the local veterinarian, in many cases, has been responsible for the inroads on his business by such agencies because of his own lack of interest. Poultry disease specialists in state colleges and veterinary schools have been emphasizing for years the needs of the poultrymen for veterinary service, have published special bulletins, held poultry clinics

and cooperated with the state and national associations in holding special poultry disease programs in an effort to improve the effectiveness of veterinarians to handle poultry disease problems. The veterinary journals have published special poultry issues and have solicited special feature articles in their attempts to promote poultry practices. There have become available to practitioners numerous new reference books on all phases of poultry. These include, Diseases of Poultry, edited by Drs. H. E. Biester and L. H. Schwarte and written by more than 30 specialists in

Injection of intradermal tuberculin.

their particular field. It was first published in 1943 and is now in its third revision. Another text book is Diseases and Parasites of Poultry by Drs. E. H. Barger and L. E. Card, also first published in 1943.

The late Dr. D. M. Campbell, editor of VETERINARY MEDICINE from its inception until his death in 1952, pioneered in promoting avian practice. Evidence of this is the increasing amount of space he devoted to poultry subjects during the years of his editorship. As early as 1911, he started to call attention of veterinarians to the need of their aid in controlling poultry disease. In an editorial on page 657 in vol. 6 (1911) of the *American Journal of Veterinary Medicine*, he stated, "But few veterinarians take an interest in treatment of diseases of chickens, yet the industry is one of the largest. This field is one to which veterinarians should give more attention than they have in the past, and it is one in which veterinarians may build up a lucrative practice." One of the early contributors to the Journal was Dr. B. F. Kaupp who, in vol. 7, page 248 (1912), wrote on mites in chickens. This was followed in the years to come by numerous articles by him and for a few years he was designated as a Department Editor on Poultry Problems.

Subjects covered in these early issues included blackhead of turkeys, internal and external parasites, milkweed poisoning, corn cockle poisoning, tympany of the crop, fowl cholera, bacillary white diarrhea (pullorum disease), tuberculosis, forage poisoning, fowl pox, and caponizing. Most of these articles were in the nature of case reports, control recommendations, and question and answers rather than original research. Beginning in 1920, the number of references increased yearly with continued emphasis of short items of interest to practioners. It will be recalled that it was in 1924 and 1925 that both fowl plague and the disease now known as infectious laryngotracheitis appeared in the United States for the first time. The appearance of these diseases stimulated increased emphasis on research on poultry diseases. Doctor Campbell continued to emphasize to his readers the importance of poultry disease as a veterinary problem and there has been an increase in original articles.

An article by Dr. F. R. Beaudette, The Field of Poultry Practice and Its Relation to the Practitioner, and one by myself, Differential Diagnosis of Poultry Diseases and Technic of Postmortem Examination of the Fowl, both published in 1924 are examples of attempts to interest the practitioner in an avian practice in the early 1920's. In 1928, 38 articles were reprinted from VETERINARY MEDICINE into a booklet titled, Poultry Practice. This was revised and reprinted in 1930. In 1940, a 3rd edition was completely rewritten under the editorship of Dr. L. D. Bushnell. To further stimulate interest in avian practice he re-established in VETERINARY MEDICINE in 1948 a special department on poultry practice. A project which has added materially in developing interest in avian practice is the holding of special short courses and clinics featuring poultry husbandry and disease control. Pioneers in this field were Kansas State College and Purdue University.

These attempts have paid dividends, and more and more practitioners are finding that there is additional income to be had by giving attention to poultry. There are a number of examples of men who have made a success with a poultry practice either as a specialty or in connection with a general practice. Examples that I personally know about, and I am sure there are many others, are as follows:

Dr. C. M. Carpenter established a specialized practice in Petaluma, Calif. in about 1924. Later, he moved to southern California and continued there until he gave up his practice to enter other fields of activity. He is currently, President of the Institute of American Poultry Industries, Chicago. Dr. D. E. Davis, began a specialized poultry practice in Petaluma about 1926, after having been in charge of a University of California Poultry Research Laboratory in Petaluma for a few years. He and his partner, Dr. W. H. Dungan also operate a "chicken pharmacy." Another veterinarian in Petaluma, Dr. W. E. Brandner, has for a number of years successfully combined a poultry practice with a dairy practice. These men have been located in an area where poultry is raised as a major industry. They have an advantage of having available in Petaluma one of the oldest state-supported diagnostic laboratories.

In Vineland, N. J., which is the eastern counterpart of Petaluma, Dr. Arthur D. Goldhaft has operated a specialized poultry practice since about 1920.

Examples of general practitioners who have been devoting major efforts to poultry are: Dr. F. C. Tucker of Claypool, Ind.; Dr. E. S. Weisner of Goshen, Ind. and Dr. M. P. Chapman of Sherwood, Ore. Doctor Tucker lives in Kascuisko County, Indiana, a county which claims to have the highest poultry population of any county west of the Allegheny Mountains except for the Petaluma area of California. Doctor Tucker has maintained an active avian practice since 1925. He reported on 25 years of his experience as an avian practitioner at the 86th annual meeting of the A.V.M.A. in Detroit in 1949. Doctor Weisner obtained his background in poultry diseases under Dr. H. J. Stafseth, and for a few years was an extension specialist in poultry diseases in Michigan. He serves his own community and acts also as a consultant and specialist for the surrounding territory. Doctor Chapman is a general practitioner located near Portland, Ore. He discussed his views on this subject at the 91st annual meeting of the A.V.M.A. in Seattle in 1954.

Little mention has been made of turkeys as a source of income to be considered by

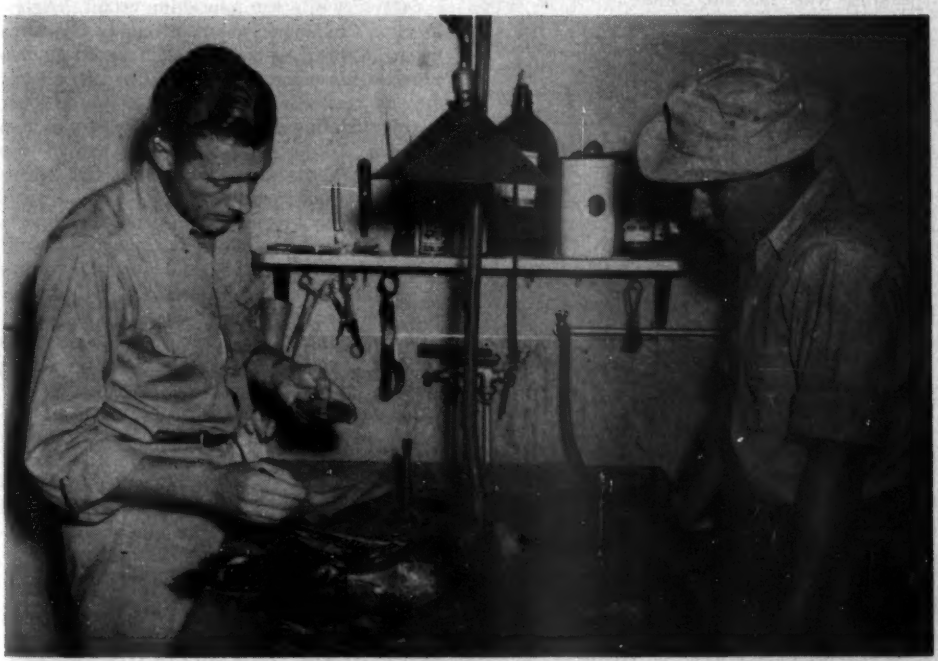


Photo courtesy Turkey World

Dr. Clifford Nelson, Jewell, Iowa (l.) conducts an extensive rural practice in the Ellsworth turkey growing area. Equipment for complete laboratory diagnosis is an important feature of the service available to poultry growers and other livestockmen.

the practitioner. Both the value of an individual bird and the total value of a commercial flock merits the interest of the veterinarian as a source of income. A single male turkey at market age may be worth $10. to $15., and a flock of 5,000 turkeys at least $35,000. by market time. Many turkey growers have as much invested as do swine, sheep, or cattle raisers. A veterinary team which has developed a service to turkey growers is that of Drs. Clifford Nelson and Robert Ahrens of Jewell, Ia. Their interest in turkeys and the services they are rendering attracted the attention of an editor of *Turkey World*, Mr. Alex Gordeuk, who interviewed them and published a tribute to their work (*Turkey World*, July 1, 1955). Doctor Nelson also reviewed his experiences at the 92nd annual meeting of the A.V.M.A. in Minneapolis, Minn. in 1955. Doctor Nelson admits that he has one of the most important attributes for an avian practitioner in that he has always had a personal interest in poultry.

Developing an Avian Practice

I have about as much right to give advice on developing a poultry practice as a child specialist who has no children has to give advice on how to bring up children. I have had no experience in private practice since graduating from veterinary college. I have, however, had 32 years experience in avian pathology research, much of which has been working directly with poultrymen and veterinarians under field conditions, and have accumulated some ideas that may prove of value.

I would strongly advise anyone thinking of starting a poultry practice to consult one or more of the number of practitioners who have made a success in this field. A good start would be to review the papers given at the Symposium on the Role of the Veterinarian in the Control of Poultry Diseases given at the 91st annual meeting of the A.V.M.A. in Seattle, Wash., August 23-25, 1954. A paper given in the symposium by Dr. M. P. Chapman, a practitioner in Sherwood, Ore., is especially recommended. I can do no better than to repeat many of the points emphasized by Doctor Chapman since they coincide so well with my own observations and ideas. One of the first prerequisities to developing an avian practice is to have a keen personal interest in poultry. An avian practitioner must have a workable knowledge of poultry husbandry and if not an expert in all husbandry practices must at least be able to cooperate with the poultry owner in getting him the best available information if it is needed to help him prevent losses. He certainly should know the various breeds and varieties of fowl and be able to converse in the language of the poultryman.

All the veterinary schools now require courses in poultry husbandry and give courses in poultry diseases including clinical and laboratory training in diagnosis. I agree, however, with Doctor Chapman, that it will pay a veterinarian to get additional experience by working in a state or federal diagnostic laboratory, or taking special graduate courses in poultry including nutrition, management, as well as diseases, and/or by working with a practitioner before embarking on his own project.

One thing which is too often forgotten is that the poultry flock is composed of a large number of individuals, the value of each of which may be small but the total owner investment may often be equal to that of a cattle, swine, or sheep owner. It is essential that the total investment in a chicken or turkey flock be considered in determining the source of income.

Selection of a location is important. Again, Doctor Chapman makes a good suggestion when he states that he selected a metropolitan area in the vicinity of feed mills, and a large poultry market. He has developed a practice largely catering to servicemen who call him for help for their customers. Another plan would be to promote hatcherymen as clients to service their supply flocks. Several years ago, I knew a veterinarian who successfully contracted with his clients on a yearly retainer fee basis. Such a plan could include routine vaccinations, periodic inspection of flocks for determination of health status and such routine autopsy service as deemed necessary with emergency calls paid on a call basis. Sexing day-old chicks for hatcherymen, artificial insemination of turkeys and poultry inspection for the local health department are other examples of services to be rendered. Acting as a consultant to feed dealers, hatcherymen and even to poultry equipment dealers is a local service that would be of benefit to the practitioner, the employer, and to the poultrymen in the area.

Group practice for veterinarians probably will become popular in the next few years. This type of practice would be an answer to the need for more and better veterinary service for poultrymen. To manage a poultry practice adequately, a well-equipped laboratory

is a necessity, especially if a state supported one is not readily available. A group practice with specialists in various fields could well afford a well staffed and equipped laboratory which would serve all the participants and make better service available to the poultry disease specialist of the group.

An outstanding accomplishment in research of importance to practitioners during the past two decades is the discovery that many of the infectious diseases respond to treatment of the newer drugs discovered by medical research. This is encouraging to the veterinarian who formerly could offer a chicken or turkey raiser little hope of reducing mortality once a disease started in a flock. Also, many of the virus diseases now can be prevented by vaccination. Drugs and vaccines have not replaced good managerial practices but they have become a valuable adjunct and in general can be dispensed with confidence. The almost universal use of antibiotics in poultry feeds and the equally universal trend towards medication of feeds with certain drugs for control of coccidiosis and some other infectious diseases have presented new problems to the practitioner, because of much abuse of the practice. It is important that the practitioner interested in poultry keep abreast of the vast amount of medicated feed propaganda given nowadays to poultrymen in order to give them the best advice on what to accept and what to discard. Keeping a poultryman client properly advised is a way to save him money, gain his confidence and increase the income of the veterinarian.

Comments

The purpose of this article has been to help commemorate the 50th or Golden Anniversary of VETERINARY MEDICINE. It is fitting that a paper on poultry diseases with special reference to avian practice be included in this anniversary issue because its former editor, the late Dr. C. M. Campbell, was a strong supporter of avian research and always urged veterinarians to take more interest in an avian practice.

An attempt has been made to review briefly the progress made in the poultry disease field up to and since the time the forerunner of VETERINARY MEDICINE, *The Iowa-Nebraska Veterinary Bulletin* was started in 1905. Emphasis has been placed on the scientists who pioneered this field up to and including the early 1920's when poultry research in all its phases really came into its own. I am sure many worthwhile reports of progress, and many outstanding names have been omitted but this has not been intentional. I hope that enough examples have been given to convince readers that the field of poultry diseases was not neglected even in earlier periods. To review the period from 1925 adequately would be impossible in a single article. Examples of accomplishments during the past three decades, include the progress made in pullorum disease eradication; progress in control of histomoniasis and in turkey diseases in general; the eradication of fowl plague on two occasions; the advances made in research on respiratory diseases; the establishment of voluntary federal inspection of dressed poultry in 1929; the inauguration of the National Poultry Improvement Plan in 1935; the establishment of the Federal Cooperative Regional Laboratory for Poultry Research at East Lansing in 1939, and the progress made in research on lymphomatosis as a result of its establishment; the marked advances in development of vaccines for virus diseases; and the discovery of antibiotics and other specific drugs which have

Infectious diseases in flocks and herds are the limiting factor in profitable production of meat foods.

aided in controlling many infectious diseases. Included also must be the advances made in genetics, nutrition, and general management practices which have, in turn, done much to aid in the prevention and control of poultry diseases. In spite of all these accomplishments, the annual loss from mortality is estimated at $300,000,000. per year. It must be recognized that during the years of such marked progress, all phases of the poultry industry have expanded in great proportions and new problems have resulted. Research has barely kept abreast. This all indicates that there is much future work for the veterinarian to do to meet the challenge that is being made by the industry.

I firmly believe that there is an opportunity for the practitioner to do a good service to the poultry industry and to earn additional income from his efforts. I have tried to suggest a few methods of approach. As a further aid I have included selected references which are recommended for further reading. Others are included for historical purposes.

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Advances Made In Swine Practice

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TIMES change and veterinary medicine moves ahead. As advances occur, it is inevitable that drugs, biologicals, and practice procedures, which at one time were accepted as being highly efficacious, should be discarded. We can not do today's work with yesterday's methods and stay in business tomorrow. Most veterinarians have imaginative and inventive minds and, seeing the need for something or a need for a better way of doing things, proceed to find that better way.

Veterinarians must possess the qualifications to maintain a personal interest in all individual animals they are called upon to treat. Some fear that veterinary colleges are educating young men far beyond their capacities or below the top needs of the profession. While the veterinarian may not care to become an economic expert or a social scientist, it is clear that he must be prepared to advise and guide in those activities and many others, as they affect the farmer and his livestock.

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In recent years, increasing frequency of occurrence of various swine diseases has increased importance of understanding the natural history of disease and the problems of proper management. A larger experience makes it apparent that no single method of attack is uniformly successful in all swine, with some conditions having so many underlying causes and variations in course and severity. In some swine diseases, where the basic cause of the condition can not be found, an exact history must be obtained on which to base rational therapy and, more important, to evaluate results of treatment.

Changing trends in therapeutics employed in swine practice emphasizes the urgency to be alert constantly for new drugs, and new ideas as to application of older ones. No sooner one learns to use a drug, than another claiming superiority is offered in its place. As newer drugs are developed and as their potency is increased, it may be necessary to regulate dosage by every means available, including the determination of blood levels, urinary secretion, and elimination. Today's aggressive veterinarian is relying on more laboratory procedures in an attempt to arrive at accurate diagnosis and treatment.

To all who are progressive minded, part of this report may serve as an inspiration and guide. It often takes more than conclusions or opinions, no matter how strongly worded, to convince growers that present-day diseases of swine are often most difficult to diagnose and that in many cases a laboratory examination is necessary. There would be less difficulty in differential diagnosis if there were a close cooperation between the laboratory and the swine practitioner. More veterinarians today are taking advantage of the laboratory than ever before. This is a trend in the right direction because it helps eliminate empiric treatment. Empirical treatment before an accurate diagnosis is reached should be thoroughly condemned.

*Allied Laboratories, Sioux City, Ia. President, Iowa Veterinary Medical Association, 1955.

The 1954 value of livestock was placed at $27,000,000,000. One hundred forty million dollars were spent to protect it, which represents less than 0.5% of valuation. Only 60% of swine farrowed reach market age, and only 40% of pigs farrowed are vaccinated against hog cholera. Numbers of market swine offered have increased yearly and will continue to even larger figures to provide for a growing population.

The full measure of progress made in swine practice becomes apparent when visualized against the background of the practices of an earlier day. Disease control today is based on past experiences with scientific precision of modern methods of prevention, control, and treatment of many conditions which either did not exist 50 years ago or were not recognized. Veterinarians now rely on an accurate diagnosis (aided by laboratory procedures), serums, bacterins, antitoxins, vaccines, sulfonamides, hormones, anesthetics, surgical instruments, antibiotics, and other medicinal agents which conform to the most rigid standards. Today's veterinarians are better trained by education to do the work assigned.

It would be impossible to cover all progress made in swine practice during the past 50 years and give due credit to the fine men who have contributed to the sum total of our knowledge. Each has contributed a portion which has added to benefit.

A review of veterinary literature, reveals that only one book published by an American veterinarian is devoted exclusively to swine diseases. It was written by Dr. A. T. Kinsley in 1914 and revised in 1937. At that time, only a few infectious diseases of swine were listed: Hog cholera, swine plague, tuberculosis, pyemic arthritis, spasms of the diaphragm, rabies, and foot-and-mouth disease.

It has been most unfortunate for the profession that there has not been a text book published on swine diseases for such a long period. The only excuse that could possibly be made is that advancement has been so rapid that, should a book be written, it would require frequent revision to be kept up-to-date. For example, within the past few years several so-called new diseases of swine have appeared; including, enterotoxemia (gut edema), atrophic rhinitis, leptospirosis, infectious gastroenteritis, virus pneumonia, virus arthritis, infectious hepatitis, toxoplasmosis, and histoplasmosis.

In this report, it is impossible to give due credit to all who have served the profession so ably during the past 50 years. An effort

from collection of Doctor Dykstra

Laboratory for production of hog cholera antiserum and virus. Photo dated 1907.

will be made to present only those conditions and diseases in which progress has been made and to invite the attention of our readers to some swine diseases that need further research.

For a number of years, hog cholera appeared to be the number one disease killer of swine. For many years it was uncomplicated and postmortem lesions were well established. This is not true today. Few cases are observed of what appears to be uncomplicated hog cholera.

Each swine disease entity will be taken up separately in relation to its present day importance. Advances made in hog cholera immunizing products will be discussed first.

Part I: Hog Cholera

The United States Department of Agriculture report for 1913 gives the total number of swine in the United States as 61,178,000; 8,720,000 of which were estimated on Iowa farms. The estimate for 1955 is 101,000,000.

The first outbreak of the disease among swine in the United States, considered to be hog cholera, occurred in Ohio in 1833. The disease spread rapidly among swine droves in the Midwest.

The Bureau of Animal Industry was established by an act of Congress on May 29, 1884,[1] the Veterinary Division of which was under the supervision of Dr. D. E. Salmon. Under reorganization, in 1891, a Division of Animal Pathology was established. To it was assigned all scientific investigations in regard to the nature, course, prevention, and treatment of animal diseases. Among the early men assigned to hog cholera control were Dr. John McBirney, 1897, to Sioux City, Iowa; Dr. William B. Niles, 1898, to Clarinda, Iowa; and Dr. Charles Mason Day, 1899, to Clarinda, Iowa. All of these men were graduates of Iowa State College.

In 1890, Dr. Smil A. deSchweinitz, a chemist, was made Chief of the Biochemic Division, BAI. His work was to study the chemical products produced by the hog cholera bacillus which was then believed to be the etiological agent. In 1892,[2] the true cause of hog cholera was found to be a filterable virus and not *Salmonella cholera-suis* as had previously been thought. These findings were announced in 1903 in Bureau Circular 41.

Between 1903 and 1906, Dr. M. Dorset, Dr. W. B. McNiles and Dr. C. N. McBryde, produced and used effectively hog cholera antiserum. In 1907, they vaccinated swine on 47 farms in Iowa, using the simultaneous method.

Photo Courtesy Pitman-Moore Company, Division of Allied Laboratories, Inc.

Final bleeding for hog cholera antiserum in a modern plant. The "canula" method is employed rather than the "open stick" procedure to avoid contamination.

During 1908, representatives from 25 states visited the experiment station at Ames, Iowa, to learn the methods of producing antiserum (named anti-hog-cholera serum) and virus. Shortly afterward, commercial producers began to manufacture the products and, in 1913,[5] Congress passed the Virus-Serum-Toxin Act which is in force today. Dr. H. J. Shore was in charge of the office. He was also in charge of supervising inspection work in serum plants.

From 1906 until 1915, all anti-hog-cholera serum was produced as defibrinated blood. In 1916, Dr. M. Dorset and R. R. Henley produced the first clear serum by a process of adding bean extract and concentrated salt solution to the defibrinated blood and then, by centrifugation, the cells became packed in the bottom of containers. The clear serum was poured off, heated to 58 C. for one-half hour, and preservative added. Little improvement of the product has taken place since that time due to the strict production requirement regulation contained in the Virus-Serum-Toxin Act.

Hog cholera virus production has not changed. The blood from cholera sick pigs is still drawn on the sixth and seventh day after artificial infection.

In 1911, 219 head of pigs on an Iowa farm were vaccinated for hog cholera by the simultaneous method. The record indicates that, in those days, this was about the only disease that affected an entire herd. Though considered uncomplicated, 2% of the vaccinated pigs died following vaccination. No other immunization method has been given such satisfactory results over so long a period. It is still widely used and recommended by practitioners specializing in swine practice.

Swine practice generally was influenced by the discovery of the etiological agent of hog cholera. Prior to that time, most of the veterinarians' duties were concerned with horses.

Chief objection to the simultaneous method is the fact that live and active virus is used in conjunction with antiserum. When a live virus is injected into a susceptible pig, even with large doses of antiserum, a reaction occurs. It may not be visible, and vaccines usually exhibited no significant rise in temperature and no symptoms of reactions. Actually, a leucopenia occurs indicating a lowered resistance and virus invasion.

When swine are vaccinated by the simultaneous method and their resistance is lowered, some may develop what is called secondary bacterial infections and some may die of either virus or bacterial invasion. Body reactions are intensified by the presence of any debilitating conditions such as parasites, nutritional disturbances, or latent infections; whether they be viral or bacterial.

In 1949 and again in 1950, the so-called variant hog cholera virus was identified. As a result of the post-vaccination reactions, some practitioners, as well as swine producers, lost faith in the simultaneous method of immunization.

Crystal Violet Hog Cholera Vaccine

In 1930,[6] information was published to the effect that the BAI had been doing considerable work with hog cholera vaccines, using organs and tissues of infected hogs. Up to 1930, 15 lots of vaccines had been prepared, using varying amounts of formalin and chloroform as attenuating agents. The vaccines made from tissue pulp were promising as immunizing agents. Bureau report[6] for 1934 revealed that they were working on a vaccine which would tend to reduce the cost of immunization. It will be remembered that we were, at that time, in an economic depression. One year later[7] it was announced that at least three agents used for attenuating hog cholera virus were promising: Glycerin, phenol, and crystal violet.

The method of production, in general, consisted of holding defibrinated blood virus and attenuating agent at such a temperature and over such a period that it no longer produced sickness when injected into susceptible pigs, but would stimulate immunity after a certain interval. The crystal violet vaccine tests were most promising. Up to 1936, 63 lots of the vaccine had been prepared.

The use of antiserum simultaneously with vaccine proved unsatisfactory. Serum administered within seven days of vaccine treatment largely destroyed immunizing action of the vaccine. Seldom was any reaction observed following vaccination or after administration of virus to test immunity. In 1938[8] a patent for the method of production of crystal violet vaccine was assigned to the Secretary of Agriculture. Special recognition for the success of this product should be given to Drs. Dorset, McBryde, and Cole.

During this period, special attention was given to the development of immunity following vaccination in different age groups of pigs. Pigs vaccinated under seven weeks of age failed to develop satisfactory immunity, whereas older animals (two months or more) responded satisfactorily.

It also was discovered that other factors peculiar to the herd or to individual pig played an important part in determining the degree and duration of immunity. In 1936,[10] the BAI announced through the press the results of their work, and the method of production was released to commercial firms for the manufacture of the vaccine under government inspection. The product has been improved greatly since that time.

The BAI laboratory at Ames, Iowa produced 192,983 cc. of vaccine in 1941[11] which was used on farms supervised by veterinary inspectors. The plan was to determine the effectiveness of the treatment under field conditions by later challenging vaccinated herds by virus injection or exposure. The work indicated that vaccine neither conveyed the infection of hog cholera nor incited any sort of post-vaccination disturbance.

In the same year,[12] Cole and McBryde reported on their work with pigs nursing non-immune sows. Pigs were vaccinated with crystal violet vaccine and then later challenged by virus injection. All pigs were protected. In another group of pigs nursing immune sows, 61.5% were determined to be immune. As a result, these researchers concluded that the natal immunity in pigs nursing immune sows interferes with the antigenic action of vaccine. Experience in Great Britain[13] where the simultaneous method of vaccination is prohibited, was encouraging following vaccination trials during an epizootic in 1941. Experiments established that the virus vaccine becomes inactivated about the third day of incubation and that immunity following injection was established about the 12th day. Pigs of any age responded favorably.

The chief of the BAI[14] reported in 1943 that the vaccine needed to be improved against product contamination because some of the vaccine may not always be sterile. Crystal violet is bactericidal only for Gram-positive organisms. Crystal violet resistant contaminating organisms, originally present in the virus blood or later accidentally introduced, may ruin the product, not only the value of the vaccine as an immunizing agent but it might produce unfavorable reactions in treated animals.

Sanders and Quin[16] reported some experimental work with vaccine and concluded that the product was safe and could be used in herds that were unsuited for the simultaneous method. They concluded that this product tends to eliminate or reduce reactions observed in some herds affected with intestinal disturbances. Later they developed another vaccine, using spleen pulp instead of virus blood. The field results from the use of this vaccine were similar to those of the regular crystal violet vaccine developed by the Bureau.

In 1944, C. G. Cole[17] reported on the use of the vaccine by the intradermal method, using 1 cc. as a dose. The results were perhaps inconclusive and the method fell by the wayside because it was impractical due to the necessity of making an intradermal injection which proved to be a rather slow procedure. Pigs had to be held securely and the vaccination time element was a factor in evaluating its usefulness.

Further work by the Bureau[19] revealed that since the vaccine is derived directly from the virus, it appears likely that the potency of the vaccine would be related directly to the virulence of the virus from which it was derived. It was found that blood drawn on the third and fourth days following inoculation lacked virulence and the vaccines made from this blood were nonpotent. Blood obtained on the seventh to the ninth day was more virulent, and vaccine made from this blood was a satisfactory immunizing agent. There was no indication that the potency of the vaccine was related to the virulence of the virus. In their study of dosage, it was found that potency of vaccine is not directly related to the size of the animal. A single 5 cc. dose is more effective than two 1 cc. doses.

Work conducted in 1948-49 by Cole and Henley[20] indicated that antiserum should not be used before, with, or shortly after the administration of the vaccine. They recommended that the vaccine be used alone. Later (1953)

the Bureau reported that swine may be protected successfully by the intradermal injection of from 0.5 to 1 cc. of vaccine.

At the present time, crystal violet vaccine is not used extensively by the profession; other vaccines have replaced it because of lengthened immunity induced by the new products. The vaccine served the swine industry and the profession well because, at the time it was introduced, post-vaccination troubles were common. Rarely did a herd of swine vaccinated with the vaccine develop a reaction sufficient to cause alarm unless, in some instances, it was used in a herd that should not have been vaccinated with any product. There were some instances in which the herd contracted hog cholera from exposure before the vaccine could produce an appreciable degree of immunity. There were other cases in which hog cholera developed in a herd after the expiration of immunity. We have no knowledge of any herd developing disease as a result of the prescribed method of administration of vaccine.

It should be added that crystal violet hog cholera vaccine was a product which veterinarians needed at the time it was developed.

Boynton's Tissue Vaccine

In 1933,[23] W. H. Boynton of the Division of Veterinary Science, University of California, Berkeley, announced at the 70th annual meeting of the A.V.M.A. in Chicago the results of his work with a tissue vaccine for hog cholera. This report was the result of six years of work extending over the period from 1925 to 1932.

This vaccine was prepared from selected tissues of a pig affected with hog cholera. These were finely ground so that the finished product would pass through a 20-gauge needle. Many attenuating agents were tried. Among them were glycerine, formalin, phenol, chloroform, and toluol, all of which failed to yield satisfactory results. Finally it was discovered that from 1.5 to 5% eucalyptus oil was getting close to being effective.

Later, in 1935,[24] Doctor Boynton described in detail the method of producing what is now known as B.T.V. or Boynton's tissue vaccine. The dose recommended was 5 cc. subcutaneously to healthy swine.

One of the advantages in the use of the vaccine was that there was no local or systemic reaction; therefore, it could be used in droves affected with enteritis without bad effects. Disadvantage in its use was that it required from two to three weeks to establish immunity.

During this era, Doctor Boynton and Gladys M. Woods[25,26,27,28,29,30] developed a new laboratory diagnostic method. It was known as the gall bladder smear. It consisted of making a smear of the cells lining the neck of the gall bladder and, by special staining methods, inclusion bodies could be found within the cells upon microscopic examination. It was offered as an aid in the diagnosis of hog cholera. Although not entirely conclusive, it was used for quite a number of years by laboratories and by practitioners who used microscopic procedures in their practice.

Modified Live Virus Hog Cholera Vaccines

One of the first examples of modified live virus vaccines was the Jenner vaccine. He found that people who had recovered from cowpox were immune to smallpox. It was possible to convert smallpox virus into cowpox virus by passage from man to rabbits and then to calves.

Pasteur, in 1886, passed rabies virus from a dog into rabbit and this attenuated the virus for dogs but retained its ability to immunize the dog against rabies. Many other related examples could be given.

The literature contains a great amount of information regarding attempts to transmit hog cholera virus to hosts other than swine. Most of the attempts resulted in failure; although, in 1939,[31] Zickis reported that he was able to transmit hog cholera by intravenous inoculations consecutively through ten sheep. Blood taken from the 11th sheep was no longer infectious to pigs.

During 1941, a special joint U. S.-Canadian Commission[32] was appointed to study the possibility of the introduction of rinderpest into this continent by biological warfare. In 1942 an island was acquired in the lower St. Lawrence River and a research and development laboratory established. The scientific staff was given two problems. The first was to prepare a tissue vaccine according to methods previously developed so that large numbers of animals could be immunized. The second was to develop new vaccines, such as avianized vaccines, which would not require the use of a large number of animals.

Special recognition should be given such men as R. E. Shope, James A. Baker, Dubois L. Jenkins, Fred D. Maurer, M. W. Hale and H. K. Cooper for their splendid work which eventually led to some of the present-day modified live virus hog cholera vaccines.

Occasionally, when a virus is transferred from one animal to another of a different species, it becomes less virulent when injected back into the original species from which it was obtained, and, if the process is repeated in series, there comes a time during the transfer when the virus will produce immunity in the original species. Therefore, it becomes possible to produce vaccines containing no proof of active virus but nevertheless possessing strong immunizing power. As a result of the experiments conducted during World War II, some of the men who had done the work returned home and conducted additional work with other viruses.

Koprowski, James, and Cox (1946)[35] reported that they had successfully passed hog cholera virus for a number of generations in the New Zealand strain of white rabbits by what is known as an alternating passage method, such as pig to rabbit to pig to rabbit, et cetera. It was necessary to take temperatures of the rabbits frequently day and night during the entire period of observation, because the blood must be removed at the height of the febrile reaction which may last only a few hours. In the summary of this report they state, "Hog cholera virus has been carried for 12 consecutive passages in rabbits by using infected rabbit spleen as transfer material. Starting from the eighth spleen passage, the virus was passed back to a pig for one passage and was then carried for eight further passages in rabbits by using infected rabbit blood as transfer material. Aside from a febrile response, no other symptoms were observed in inoculated rabbits."

Dr. James A. Baker,[34] using a strain of hog cholera virus was able by continuous passage through rabbits to attenuate the virus so that it would not reproduce disease when injected into pigs but did produce immunity. This opened the field for extensive research by many commercial laboratories in the United States. All of them should be given credit for the splendid work accomplished.

Tremendous advances[35] had been made by 1951, with the original method of vaccine production as well as with many modifications of the original method. H. Koprowski, T. R. James, and H. R. Cox[36,37] had by now transferred the original virus of hog cholera through 284 rabbit passages. The vaccine consisted of such tissues as liver, spleen, kidneys and blood of rabbits ground finely by means of an Eppenbach colloidal mill and desiccated. Swine vaccinated with this product were immune to challenge with hog cholera virus and also the so-called "variant" virus. Since this type of vaccine is of leporine origin, it is obviously devoid of organisms pathogenic for swine. It was found to induce protection as early as the third to fourth day after inoculation, and the animals were immune for at least a year. Later information shows that the animals are immune for a much longer period of time. This type of vaccine[38] was given extensive field trials. The results indicated that, while being antigenic, it is not pathogenic and will not perpetuate virus on premises. Feeding practices were not changed. The vaccine was expected to be about 97.5% effective. From this original rabbit-adapted virus vaccine came many so-called modifications of methods of production.

Drs. A. H. Killinger, J. R. Dick, H. E. Pinkerton and R. I. Williamson (1951)[39] reported a newer type of hog cholera vaccine. It no doubt is a combination of attenuations of hog cholera virus by various methods with the end product being of swine tissues instead of rabbit tissues.

The swine tissue product is desiccated. It is used as a dose of 2 cc. simultaneously with 15 cc. of hog cholera antiserum.

Special licenses were issued in 1951 to three firms to produce the modified live virus vac-

A healthy herd of swine on pasture is the result of application of good husbandry practice and sound disease control program.

cines; two for rabbit origin product and one for the porcine origin product.

During 1951-1952[40] from official reports there was an overall loss from all causes of pigs vaccinated of 1.1%. This indeed was progress.

In 1952, W. A. Aitken[41] reported that, after a survey of the use of the new hog cholera vaccines, it was shown that some herds sickened between the fourth and 14th day after vaccination. Only 0.57% to 2.72% of the pigs sickened, and only between 0.1% and 1% died.

To date,[42] the use of the modified live virus vaccines has been on the increase. To a substantial extent, they have supplanted the use of serum and virus, crystal violet, and B.T.V. vaccine. Losses following vaccination appear to be about 1%.

Veterinarians today are more careful than ever before in the examination of the herds before vaccination. Many herds are treated for conditions other than hog cholera before being vaccinated. Conditions are observed which are due in part to modern feeding practices and changes in breeding methods to develop a meat type market hog.

Tissue Culture Hog Cholera Virus Vaccine

Dr. Wm. H. Boynton (1945)[43,44] reported that he had successfully passed virus through 24 passages of media culture and that, on virus titration, a concentration of virus of 10^{-9} was demonstrated. The culture medium consisted of nutrient fluid containing swine serum and sterile bone marrow from cholera susceptible pigs. After the 52nd generation on artificial media, the virulence of the virus had been reduced. This fact opened the field for a new and different vaccine. Up to 1951, the virus had been cultivated on artificial media through 180 passages which further reduced its virulence.

In February 1953,[45,46] the first tissue culture hog cholera virus was offered for sale to the veterinary profession. This was a live modified virus vaccine for immunization of healthy swine. It is a virus that has been modified by serial passage through tissue culture. It has been claimed that swine vaccinated with this product and antiserum simultaneously will be afforded adequate protection against exposure to hog cholera. Recommended dose of tissue culture virus is 2 cc. and for pigs weighing up to 100 lb., 10 cc. of antiserum.

Editor's Note: Limitations of space in this issue require that the full text of Advances made in Swine Practice by Dr. H. C. Smith be presented as a series of articles. Part II will appear in an early issue.

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ABSTRACTS OF LITERATURE

Resistance of Ova and Larva to Environmental Extremes

Data submitted in report by Senger and Seghetti[32] reveals the resistance of ova and larva of *Nematodirus spathiger*, thread-necked strongyle of sheep and cattle.

Eggs of this parasite remain viable for ten days at 98 F., develop normally at temperatures ranging from 62 F. to 86 F., live for six months in environmental temperature of 39 F. to 50 F. and for three months at 10 F. They survive —22 F. for six hours, will live in the direct rays of the sun for eight hours and for two days without oxygen.

The air-dried larva of *N. spathiger* withstands temperatures of 134 F. for two to five days and will live more than six months at 60 F. to 90 F. It survives —22 F. for four months and without oxygen for a day or two.

Such studies demonstrate resistance to environmental temperatures acquired by those troublesome parasites some portion of whose life cycle is spent outside the host's body.

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Mucosal Disease of Cattle

Mucosal disease has been diagnosed in several widely separated parts of the United States, in all breeds and ages of cattle. It is, however, observed most frequently in animals from one year to 18 months of age.

The disease, characterized by inflammation and ulceration of the digestive and respiratory systems, was first described as mucosal disease by Doctor Frank K. Ramsey of Iowa State College. Since, a disease having identical symptoms and lesions has been described by workers in several states. Schipper and Eveleth,[33] report diagnosis on 18 North Dakota farms during the past 15-month period which involved a total of 1,562 cattle. Of these, 110 cases have been confirmed and have died.

Symptoms observed are elevated temperature, inappetence, diarrhea (profuse and often bloody), and buccal ulcerations. The disease may be confused with shipping fever, vitamin A deficiency, or coccidiosis. No treatment is known. Antibiotics and sulfonamide have proved of no value.

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Chicks on Antibiotic Rations Need Free Access to Feeders

If poultry feed contains an antibiotic, make certain chicks have unrestricted access to feeders, is the advice of research workers at the Illinois Experiment Station[30].

Otherwise, say the experts, the antibiotic is wasted. Experiments indicate that the antibiotic sharpens the appetite and the extra feed consumption is necessary to bring about the antibiotic growth "boost."

The experiments were conducted primarily to learn whether the addition of antibiotics to feeds affected the basal metabolism of chicks. The researchers concluded that it did not.

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Influence of Antibiotics on Vitamin Metabolism

The authors summarize[34] extensive experiments and observations in regard to the influence of antibiotics on vitamin metabolism as follows: "We have investigated the urine excretion levels and the blood levels of a series of vitamins and the influence of antibiotics on the substances in a series of about 60 patients and healthy individuals. These showed agreement with clinical observations that significant vitamin losses in all the vitamins investigated, particularly riboflavin and nicotinic acid amide was not so unusual an avitaminotic manifestation as has been conveyed. The influence of antibiotics on vitamin metabolism appears to be consummated in three ways, namely through a direct antivitamin action, through an influence on bacterial vitamin synthesis in the alimentary tract, and through intestinal resorption.

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Clinical Evaluation Of Piperazine Adipate† As An Anthelmintic In Horses

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SUCCESSFUL horse production is based on good management, proper feeding, and efficient parasite control. The efficiency of carbon disulfide and phenothiazine has been demonstrated by Todd and Doherty,[1] however, the shock and toxic reactions observed frequently after treatment with carbon disulfide leaves much to be desired of this treatment. This is particularly evident in heavily parasitized animals, and since this is the group most in need of worming, an anthelmintic tailored to their needs is needed. Such an anthelmintic should be non-toxic, efficient, and easy and safe to administer.

The enthusiasm surrounding piperazine adipate (marketed as Coopane in England) led to our trials of this drug. The British reports are encouraging though based on a limited number of animals[2].

Chemistry of the New Agent

Piperazine adipate is the adipic acid derivative of piperazine. Piperazine is a closed ring compound also known as diethylenediamine. It was quite popular during the early part of the century as a treatment for gout and uric acid calculi[3]. It has the chemical property of forming a soluble compound with uric acid[4], however, its use was discontinued when it was found that the therapeutic level did not increase the solvent action of urine upon uric acid[5]. During the use of piperazine in man, it was found to have low toxicity[6]. In the animal body, it is partially oxidized and partly excreted in the urine.

Adipic acid is 1,4-butanedicarboxylic acid. Toxicity occurs only after prolonged use of large doses[7]. It is nontoxic at the level at which it is employed in therapeutic doses as piperazine adipate. Adipic acid and its sodium salt appears to be partly oxidized in the animal body and partly excreted in the urine[8,9].

To ascertain safety of the new anthelmintic, two foals were given amounts far in excess of the anticipated individual dosage. In addition, blood studies were conducted on 20 foals receiving both piperazine adipate and phenothiazine. In order to demonstrate the effectiveness of the drug, a total of 520 foals, yearlings, and mature horses were treated, followed by fecal studies to determine efficacy.

Procedure

To anticipate any danger of over dosage, two foals weighing 350 and 450 lb. respectively (and having worm counts in excess of 1,000

†The Carson Chemical Co., Brownville, Texas, supplied the piperazine adipate used in this study. This company is sole distributor of piperazine adipate in the United States and whose sales are restricted to veterinarians.

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TABLE 1. Chemical and Hematological Studies of the Blood of Foals Before and After Treatment with Piperazine Adipate and Phenothiazine

Animal No.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
Before Treatment																					
Bilirubin mg. %	1.55	0.78	0.91	1.27	1.50	1.22	1.27	1.48	1.14	0.89	1.00	0.83	0.91	0.72	0.87	0.83	1.07	0.78	0.83	0.89	0.78
Urea N. mg. %	12.0	13.8	14.4	14.4	12.0	13.05	11.25	13.05	14.4	14.4	13.8	12.0	15.0	14.4	13.8	12.0	14.4	13.05	14.4	12.0	12.0
Chlorides (NaCl) mg. %	495	510	495	490	470	480	465	505	475	500	505	500	475	480	450	480	485	475	460	495	480
Hematocrit Vol. % RBC	39	37	34	37	44	40	40	36	37	31	33	33	35	37	40	35	35	35	40	33	37
Erythrocytes Million/cm.	12.85	12.61	9.14	11.21	11.70	12.45	13.7	9.62	10.55	8.93	10.52	10.32	10.84	11.24	12.66	10.43	10.62	11.12	12.23	10.21	11.42
Leukocytes 1,000/cm.	12.85	10.6	8.75	13.1	12.85	14.5	17.6	10.6	7.0	21.35	18.15	10.9	11.2	11.0	10.7	12.2	10.85	10.2	11.2	12.4	12.2
Hemoglobin gm./100 cc.	12.0	12.2	9.8	11.1	11.8	11.0	13.0	12.0	12.0	10.0	11.0	10.1	10.8	11.0	12.8	10.6	11.0	11.0	11.6	10.0	11.0
% Differential WBC																					
Segmented cells	26	46	35	40	46	53	30	38	33	48	42	51	40	52	45	58	55	48	39	46	52
Stab cells	4	1	5	3	2	1	2	4	3	2	2	5	4	4	2	5	6	3	1	2	4
Lymphocytes	69	48	57	50	50	42	65	53	61	47	52	37	54	40	49	32	33	43	54	50	40
Monocytes	3	1	2	2	2	2	1	5	3	1	4	2	1	2	2	4	4	2	2	1	2
Eosinophiles	1	4	—	5	—	2	2	—	—	2	—	4	1	2	2	1	2	4	4	1	2
Basophiles	—	—	1	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—
After Treatment																					
Bilirubin mg. %	1.83	2.15	—	—	0.87	1.68	1.18	1.27	1.00	0.87	0.87	1.00	1.27	0.78	0.98	1.50	1.28	0.84	1.14	0.98	0.96
Urea N. mg. %	16.8	10.05	—	—	13.05	13.8	13.8	13.8	15.6	14.4	15.0	14.4	13.05	14.4	16.8	14.4	11.25	13.05	14.4	13.05	12.45
Chlorides (NaCl) mg. %	570	590	—	—	515	520	495	545	500	515	560	510	500	520	485	495	500	490	500	520	505
Hematocrit Vol. % RBC	33	31	—	—	46	35	44	35	40	31	42	40	42	45	41	40	43	42	36	40	40
Erythrocytes Million/cm.	9.65	8.23	—	—	10.67	9.92	10.86	9.44	11.25	8.62	10.64	11.31	11.56	11.83	12.52	11.24	10.9	11.15	10.14	11.42	11.67
Leukocytes 1,000/cm.	7.35	12.15	—	—	6.90	15.9	11.2	8.15	11.7	13.5	14.7	10.6	11.4	14.8	11.2	11.9	12.3	12.8	11.6	12.7	12.4
Hemoglobin gm./100 cc.	9.6	8.0	—	—	10.4	9.8	11.0	8.4	10.6	9.1	10.8	11.0	11.2	10.1	11.0	10.1	10.2	11.2	10.4	11.0	11.0
% Differential WBC																					
Segmented cells	37	48	—	—	44	49	38	40	37	48	48	49	44	52	49	52	56	55	48	44	50
Stab cells	2	2	—	—	2	3	2	3	4	3	3	4	4	3	2	4	2	4	2	3	2
Lymphocytes	57	41	—	—	48	43	56	54	56	46	46	39	49	42	44	39	38	37	46	51	44
Monocytes	3	4	—	—	2	3	2	1	2	3	3	3	2	2	2	3	3	2	3	2	3
Eosinophiles	1	5	—	—	4	2	2	2	1	1	—	5	1	1	3	2	1	2	1	—	1
Basophiles	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

ascarids eggs per gram of feces) were treated with 6 oz. of piperazine adipate via stomach tube. Blood studies were made prior to treatment and one week later. Both foals were sacrificed and autopsied to detect unkilled ascarids or any pathological changes. See table 2.

Blood studies were conducted on 20 foals from a group of 70 treated. Samples were collected prior to treatment with both phenothiazine and piperazine adipate and one week following administration. See table 1.

Having assured ourselves of the safety of the product, piperazine adipate was administered to 229 foals, 176 yearlings, and 113 mares. The dosage of 1½ oz. was given to all foals weighing less than 450 lb., and 3 oz. to all animals above this weight. With the exception of the two foals receiving massive doses all animals received phenothiazine at a rate of from 6 to 25 gm. with the piperazine. Administration in all cases was by stomach tube.

Fecal counts using eggs per gram (e.p.g.) were run on 102 individuals. The ascarid counts dropped from values of 300 to 800 e.p.g. to zero e.p.g., and the Strongyloides from values of 400 to 3,000 to zero e.p.g. in all but two animals. In these, counts of 200 or less strongyl eggs per gram of feces were found. Other counts made by the flotation method followed a similar trend.

Results of Toxicity Study: Autopsy Findings

Foal 1. Upon gross examination, about 500 cc. of a clear, yellow fluid was found in the abdominal cavity. The pericardial sac contained about 150 cc. of clear yellow fluid. No gross lesions were observed. The gastrointestinal mucosa was normal in appearance with the exception of eight bot larvae found attached at the pyloric region of the stomach. An examination for the presence of ascarids and strongyls failed to reveal adults of these species. Histological studies of the liver and kidney tissues did not reveal pathological changes.

Foal 2. Upon gross examination about 500 cc. of a clear, yellow fluid was found in the abdominal cavity and approximately 50 cc. was found to be present in the pericardial sac. No gross lesions were stated. The gastrointestinal mucosa was normal in appearance and did not reveal the presence of any parasites. A histological study of the liver and kidney tissues failed to reveal pathological changes.

Discussion

The only observed blood change in the two animals receiving excessive dosage was a reduction of chlorides. No pathology thought related to treatment or untoward clinical manifestations were observed. Worms expelled in quantity on the second day with no diarrhea. The 20 foals receiving piperazine adipate and phenothiazine consistently, demonstrated an increase in chloride level, but no untoward clinical manifestations.

Clinical treatment of 520 horses (Saddlebred, Standardbred, and Thoroughbred) with piperazine adipate and phenothiazine fulfilled our requirements of an anthelmintic.

TABLE 2. Chemical and Hematological Studies of the Blood of Two Foals Before Treatment With Excessive Doses Piperazine Adipate

Animal No.	Before Treatment 1	2
Weight	350 lb.	450 lb.
Bilirubin mg. %	0.73	0.83
Urea N. mg. %	12.2	13.4
Chlorides (NaCl) mg. %	530	495
Hematocrit Vol. % of RBC	36	37
Erythrocytes per cm.	11,320,000	11,800,000
Leukocytes per cm.	8,160	7,480
Hemoglobin gm./100 cc.	11.2	11.2
% Differential WBC		
Segmented cells	25	28
Stab cells	3	2
Lymphocytes	56	58
Monocytes	2	3
Eosinophiles	14	9
	After Treatment	
Quantity given	6 oz.	10 oz.
Bilirubin mg. %	0.86	0.88
Urea N mg. %	12.8	12.6
Chlorides (NaCl) mg. %	395	390
Hematocrit Vol. % of RBC	40	36
Erythrocytes per cm.	11,220,000	11,830,000
Leukocytes per cm.	8,620	8,570
Hemoglobin gm./100 cc.	11.8	11.0
% Differential WBC		
Segmented cells	28	27
Stab cells	2	2
Lymphocytes	52	56
Monocytes	4	3
Eosinophiles	14	12

In the clinical evaluation of this new agent, two foals weighing 350 and 400 lb. were dosed with piperazine adipate, 6 oz. and 10 oz. They expelled worms. No diarrhea or other clinical signs were observed. Blood studies revealed a reduction in chloride. Autopsy showed only bots in the gastrointestinal tract, and no pathology related to treatment.

Blood counts on 20 foals before and after treatment with piperazine adipate and phenothiazine showed only a chloride increase.

When 520 foals, yearlings, and mares were treated with the combination referred to no untoward clinical manifestations were observed, worms were expelled and egg counts dropped significantly.

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Notes from Recent Meetings

Atropine sulphate (gr. ¼), hypodermically, is a good sedative in equine colic. Mineral oil or raw linseed oil is the laxative of choice. Epsom salts is not used, as it tends to aggravate an already severe state of dehydration.

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In the diagnosis of laryngeal hemiplegia, the origin of the inspiratory "roaring" may be differentiated from soft palate and tongue noises by tying down the tongue. If, after the foregoing step, the noise on exercising the animal continues, the diagnosis of laryngeal hemiplegia is confirmed.

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For relief of cervical "choke" in horses, administer apomorphine hydrochloride, gr. 1/5 and morphine sulphate, gr. 3.

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Excessive dosage of a local anesthetic in caudal anesthesia may make a horse go half way down with resulting injury to the stifle.

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There appears to be ample clinical evidence that the use of modified hog cholera vaccine for vaccination of sows just before they are bred, frequently results in deformed pigs.

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Wait at least seven days after administration of hog cholera antiserum before injecting the full dose of virus for best results by the "delayed" vaccination procedure.

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Records of the Cornell University dairy herd revealed that if breeding is delayed for 60 to 90 days following freshening, conception rate following first service was approximately 70%. When bred 26 to 50 days following freshening conception rate at first service was only 30%.

A Ten Year Survey Of Anthrax In Livestock With Special Reference To Outbreaks In 1954

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THE history of anthrax in livestock in the United States was reviewed and data on its incidence from 1915 through 1944 was presented in a previous report. In that report[1] it was pointed out that during this 30-year period (1915 to 1945) the disease appeared to be spreading slowly; outbreaks had been reported from at least 438 counties in 43 states.

Commencing with 1945 and continuing through 1954 national surveys were made yearly, and after May 1952 monthly, to obtain information on the prevalence and distribution of anthrax in livestock[2,3,4,5,6,7]. The data presented in the following report on the incidence for 1954 completes the figures on incidence covering the ten-year period (1945 to 1955). Therefore, information is now available for reanalysis of the anthrax picture for the last decade.

VETERINARY MEDICINE has published each year since 1947 an annual report of the incidence of anthrax in the United States. Each of these has been prepared carefully by Dr. C. D. Stein, Animal Disease and Parasite Research Branch, Agricultural Research Service, USDA, and his associates.

This review, covering the past ten-year period, summarizes epidemiological information on this century-old disease of livestock in the United States. As a survey, it is an outstanding example of mortality and morbidity reporting on a specific animal disease that might serve as a model.

1954 Survey

The data presented in this report are based principally on the information contained in the monthly anthrax reports submitted to the Agricultural Research Service by the livestock sanitary officials of different states and territories, and on a field survey made in Mississippi and Louisiana by the authors.

Data computed from these reports reveal that during 1954, 429 outbreaks were reported from 23 states with a loss of 1,740 cattle, 123 swine, 333 horses, 103 sheep, 24 wild animals kept in captivity, and one deer. This information is contained in tables 1 and 2, and graph 1.

With the exception of the outbreaks of a severe nature involving heavy losses of livestock that occurred in southeastern Louisiana, and southwestern Mississippi, most of the outbreaks were sporadic and involved principally cattle with small losses.

In 1954, outbreaks in 11 counties which had no recorded previous history of the disease were reported from one county each in Colorado, Louisiana, North Dakota, Pennsylvania, South Carolina, and Wyoming, two counties in Iowa and three in Mississippi.

Infected soil was reported as the suspected source of infection in 95% of the outbreaks, with 5% reported of unknown origin. Of the 429 outbreaks reported in 1954, 380 were confirmed by laboratory examination. Table 1.

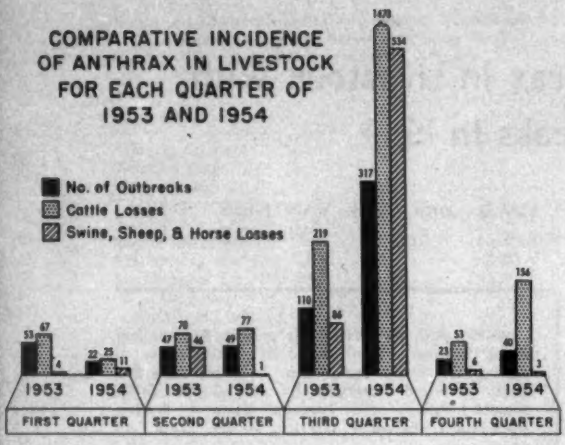
Records of the Meat Inspection Branch for 1954 show that at establishments operating under federal meat inspection 23 hogs and one cow were condemned for anthrax. Records of the United States Public Health Service give a preliminary total of 19 cases in man for 1954.

Outbreaks in Louisiana and Mississippi

Anthrax control is an old problem in Louisiana. The disease has existed in that state since its early settlement by the French. Outbreaks have been reported from all but nine counties. Severe epizootics of the disease in domestic animals are recorded as having occurred between 1834 and 1850; 1895 and 1902; 1920 and 1925, and in 1943[1]. During the last decade major outbreaks involving numerous premises with heavy losses occurred in 1946 and 1948.

According to Heeren[8] the incidence of human anthrax in Louisiana is also comparatively

*Animal Disease and Parasite Research Branch, Agricultural Research Service, U. S. Department of Agriculture.



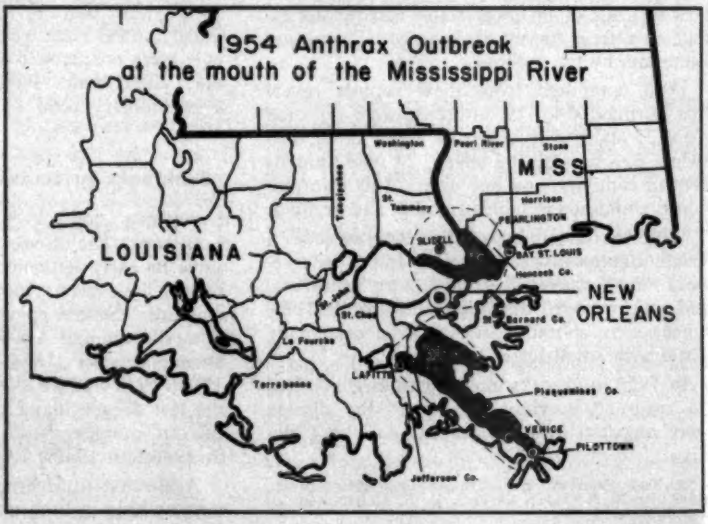
Graph 1.

high; 111 cases being reported from 1920 to 1945. Most of these appeared to be of agricultural origin since they occurred in areas where the disease was prevalent in livestock.

The area south of New Orleans had widespread outbreaks of anthrax in June, July, and August, 1954, involving portions of Jefferson, Saint Bernard, and Plaquemines parishes. The area involved varies in width and extends southward along the banks of the lower Mississippi River to its mouth, a distance of about 90 miles. The general elevation is comparatively low, varying from two to 25 feet above sea level. Although the river is retained in its channel by levees throughout most of this area, much of the terrain, which consists of low, marshy land with many lakes, bayous, and canals, is inaccessible by road and subject to overflow. In some sections of the area, especially near the mouth of the river, the cattle pastures are composed of comparatively narrow strips of natural levee a few feet above the water level, beyond which are marshlands. See map 1.

The last severe epizootic occurred in this area about 20 years ago and since the disease had not been a problem for the past several years, most of the cattle owners had neglected to vaccinate. As a result, a large number of susceptible livestock existed in the area. A long period of dry weather followed by frequent rains and extremely hot weather together with a great increase in the number of biting flies, mosquitoes, and other insects also appeared to favor the occurrence and spread of disease in this area.

The outbreaks in this area had about subsided when a second focus of infection of a less severe nature appeared during the latter part of August north of Lake Pontchartrain near Slidell in St. Tammany parish. During September a number of additional outbreaks with a heavy loss of cattle occurred in an old enzootic area in Lafourche parish and a recurrence of anthrax was also reported in Jefferson parish, where a number of recently vaccinated animals developed the disease. During 1954, sporadic outbreaks were reported to have occurred in at least nine additional perishes in Louisiana. The reported losses during July, August, and September were 1,337 cattle; 208 horses; 109 swine; and three sheep.



Map 1.

A severe outbreak of anthrax also occurred during the latter part of July and August in Hancock County in southwestern Mississippi. Reported losses of livestock in this area were 60 cattle; eight horses; 100 sheep; and one hog. Sporadic outbreaks with minor losses were also reported to have occurred in at least seven additional counties in Mississippi. Map 1.

The outbreaks in southeastern Louisiana and southwestern Mississippi had many features in common. The type of terrain was similar, climatic conditions were identical, and both areas were subject to flooding by the Mississippi river.

Quarantine, wide-scale vaccination, prompt and proper disposition of carcasses, and other sanitary police measures were employed by state livestock sanitary officials of Louisiana and Mississippi to combat the spread of infection. In Louisiana, at least 26,500 head of livestock were vaccinated against anthrax during July, August, and September, while a large number of exposed animals in Mississippi were likewise vaccinated.

Possible Role of Insect Vectors

What part, if any, biting flies may have played in the dissemination of anthrax in the recent widespread outbreaks in Louisiana is not definitely known, but the possibility of insect transmission in rapidly spreading outbreaks should always be considered. In this connection it is interesting to note that Dr. F. B. Wheeler, state veterinarian of Louisiana, reported that Dr. H. B. Elliott, director of the Livestock Sanitary Board Laboratory, had isolated a virulent strain of anthrax from the body of a biting fly captured while feeding on a field case of anthrax.

According to Heeren[8] biting flies have been frequently mentioned as possible agents of transmission in early reports covering outbreaks of anthrax in Louisiana and mechanical transmission by insects had been accepted in Louisiana as one of the common modes of transmission many years before its possibility was proved experimentally.

Outbreak of Anthrax in Zoo Animals

An unusual outbreak was reported during June 1954 among carnivorous animals in the Woodland Park Zoo in Seattle, Washington. The outbreak was attributed to feeding meat from a zoo pony that died suddenly without showing any suggestive symptoms of infection.

A postmortem examination performed on the pony by the zoo veterinarian failed to re-

TABLE 1. States Reporting Anthrax Outbreaks in Livestock in 1954 and Data on Incidence

State	No. Outbreaks	No. Counties	Losses from Anthrax					Suspected Source of Infection		Outbreaks Confirmed Lab. exam.
			Cattle	Swine	Horses	Sheep	Total	Soil	Unknown	
Ala.	1	1	6	—	—	—	6	1	—	1
Ark.	1	1	3	—	—	—	3	1	—	1
Cal.	15	8	35	—	—	—	35	14	1	11
Colo.	1	1	1	—	—	—	1	—	1	1
Fla.	4	2	6	—	—	—	6	4	—	4
Ill.	10	4	14	9	—	—	23	6	4	10
Ind.	1	1	1	1	—	—	2	—	1	1
Iowa	5	5	3	2	—	—	5	—	5	5
La.	331	14	1499	109	310	3	1921*	331	—	296
Minn.	3	3	4	—	—	—	4	3	—	2
Miss.	21	8	83	1	19	100	203	21	—	19
Mo.	6	2	7	—	—	—	7	6	—	4
Nebr.	2	1	—	—	—	—	—	2	—	—
Nev.	2	2	5	—	2	—	7	2	—	2
N. M.	1	1	7	—	—	—	7	1	—	1
N. Y.	3	3	6	—	—	—	6	2	1	1
N. D.	5	4	11	—	1	—	12	5	—	5
Pa.	1	1	3	1	—	—	4	—	1	1
S. C.	1	1	1	—	—	—	1	—	1	—
S. D.	8	5	11	—	—	—	11	8	—	8
Tex.	4	4	15	—	—	—	15	—	4	4
Wash.	1	1	—	—	1	—	1**	1	—	1
Wyo.	2	2	19	—	—	—	19	1	1	2
23	429	75	1740	123	333	103	2299	409	20	380

*Does not include 1 deer

**Does not include 24 zoo animals (3 cougars, 14 racoons, 3 bobcats, 2 coati mundi and 2 badgers)

TABLE 2. States Reporting Anthrax Outbreaks in Livestock* from 1945-1954 Inclusive, and Data on Incidence of the Disease[A]

	1945		1946		1947		1948		1949		1950		1951		1952		1953		1954	
	No. Outbreaks	Livestock Losses	No. Outbreaks	Livestock Losses	No. Outbreaks	Livestock Losses	No. Outbreaks	Livestock Losses	No. Outbreaks	Livestock Losses	No. Outbreaks	Livestock Losses	No. Outbreaks	Livestock Losses	No. Outbreaks	Livestock Losses	No. Outbreaks	Livestock Losses	No. Outbreaks	Livestock Losses
Ala.	1	3	1	1	0	0	2	10	1	1	2	6	1	2	1	1	0	0	1	6
Ark.	0	0	0	0	20	60	0	0	1	1	0	0	4	8	13	44	6	23	1	3
Cal.	47	170	38	239	31	259	28	149	25	315	14	83	18	201	44	170	11	45	15	35
Colo.	1	8	2	45	0	0	0	0	0	0	0	0	1	5	3	5	3	8	1	1
Fla.	0	0	0	0	0	0	0	0	0	0	0	0	21	209	12	99	13	45	4	6
Ga.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	39	1	0	0	0
Ill.	0	0	2	15	1	1	1	1	3	6	0	0	14	287	128	399**	46	134	10	23
Ind.	0	0	0	0	0	0	0	0	1	7	0	0	1	4	217	309	2	3	1	2
Iowa	0	0	1	1	0	0	0	0	0	0	1	4	16	289	94	186	16	31	5	5
Kan.	1	5	0	0	0	0	0	0	0	0	0	0	0	0	361	649	6	6	0	0
Ky.	0	0	0	0	4	35	0	0	0	0	0	0	12	193	1	15	0	0	0	0
La.	0	0	1+	3000	0	0	1+	1200	18	298‡	13	342	15	82	19	30	15	40	331	1921
Md.	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mass.	0	0	0	0	1	7	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mich.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	45	162	0	0	0	0
Minn.	10	13	0	0	1	3	3	13	1	1	0	0	3	17	5	8	8	13**	3	4
Miss.	7	35	9	66	4	52	30	118‡	1	1	3	10	2	3	7	5**	0	0	21	203
Mo.	3	30	48	239	24	113	9	15‡	2	6	1	1	150	694	14	43	10	41	6	7
Mont.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	6	1	1	0	0
Nebr.	3	34	3	15	4	15	11	17	7	12	7	7	3	7	5	18	11	32	2	0
Nev.	1	6	2	12	2	26	4	19	0	0	0	0	30	155	4	8	2	3	2	7
N. J.	0	0	0	0	0	0	1	1	3	14	0	0	4	15	104	68**	2	2	0	0
N. M.	1	14	1	21	0	0	0	0	0	0	0	0	0	0	3	23	1	2	1	7
N. Y.	1	1	3	3	4	4	5	8	4	6	2	3	1	1	18	17**	5	9	3	6
N. C.	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
N. D.	2	28	0	0	0	0	0	0	0	0	0	0	1	5	1	5	1	3	5	12
Ohio	0	0	0	0	0	0	0	0	0	0	0	0	1	50	316	471	0	0	0	0
Okla.	0	0	0	0	1	28	0	0	0	0	0	0	5	39	10	72	3	16	0	0
Ore.	0	0	0	0	1	6	0	0	0	0	1	1	5	14	1	1	1	2	0	0
Pa.	0	0	1	2	1	3‡	0	0	1	8‡	0	0	0	0	0	0	0	0	1	4
S. C.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1
S. D.	12	32	29	80	8	30	11	30‡	11	15‡	7	8	7	31	13	14	44	82	8	11
Tenn.	0	0	0	0	0	0	0	0	0	0	0	0	140	265	2	4	0	0	0	0
Tex.	7	204	19	277	14	233	13	44	13	81‡	9	129	25	172	165	419	19	45	4	15
Utah	0	0	1	1	0	0	0	0	0	0	0	0	0	0	3	16	0	0	0	0
Va.	0	0	0	0	1	3	0	0	0	0	0	0	0	0	0	0	1	3	0	0
Wash.	0	0	0	0	1	1	0	0	0	0	1	1	0	0	0	0	3	5	1	1**
Wisc.	0	0	0	0	1	1	0	0	1	1	0	0	3	5	29	84**	2	3	0	0
Wyo.	0	0	0	0	0	0	1	29	0	0	0	0	0	0	1	61	0	0	2	19
Total	97	583	163	4019	124	880	120	1654	93	773	61	595	483	2753	1644	3451**	233	597**	429	2299**

(A)See table 3 for 10 year totals. *Cattle, horses, sheep, and hogs. +Major outbreaks involving numerous premises. ‡Losses estimated. **Mink, dogs, and wild animals not included in total livestock losses.

veal an enlarged spleen or other pathological alterations of the abdominal organs indicative of anthrax. However, the superficial pectoral muscles and surrounding tissues were edematous and infiltrated with a yellow gelatinous fluid resembling a bruise. The heart was hemorrhagic and a clot was observed at the junction of the aorta and pulmonary artery. These findings suggested that the pony died from shock caused by a severe blow in the pectoral region. In accordance with the practice at the zoo in accident cases the carcass was butchered and fed to about 60 meat-eating animals. Four to six days later, 24 of the zoo animals including three cougars, 14 racoons, three bobcats, two coati mundi, and two badgers died of an unknown condition, which was later determined to be anthrax on laboratory examination. Six additional felines showing early symptoms of anthrax and all the lions, tigers, leopards, and other exposed cats were treated with terramycin® or penicillin and no further losses occurred.

It was also reported that an outbreak of anthrax occurred in a herd of Japanese Sika deer in the same Seattle Zoo 21 years ago. However, the pony that died in the recent outbreak was reported to have had no contact with the area in which the outbreak in deer occurred.

In this connection, it should be pointed out that a number of cases of a typical anthrax have been reported in horses where lesions are confined to the throat and neck. These exhibited edematous infiltration of the subcutaneous and intramuscular tissue and glands in the throat with usually no involvement of digestive tract, liver, spleen, and kidneys. Several cases of this type were reported by McNellis[5] in an outbreak that occurred in a large number of Peruvian army horses that were kept in a contaminated pasture.

A Ten-Year Survey of Anthrax Incidence in Livestock

A review of the data covering the incidence of anthrax in livestock from 1945 to 1954 collected and compiled by the former Bureau of Animal Industry and the present Agricultural Research Service[6,9,7] reveals that during this ten-year period 3,447 outbreaks were reported from 39 states with total losses of 17,604 head of livestock. The nine states that reported no outbreaks during this period were Arizona, Connecticut, Delaware, Idaho, Maine, New Hampshire, Rhode Island, Vermont, and West Virginia. The greatest number of outbreaks and largest loss of livestock were reported from California, Louisiana, Missouri, South Dakota, and Texas. A second group of states that reported numerous outbreaks with fairly heavy losses were Arkansas, Florida, Illinois, Indiana, Iowa, Kansas, Kentucky, Mississippi, Nebraska, Nevada, New Jersey, Ohio, and Tennessee. (Tables 2, 3, and 4, graph 2 and map 2)

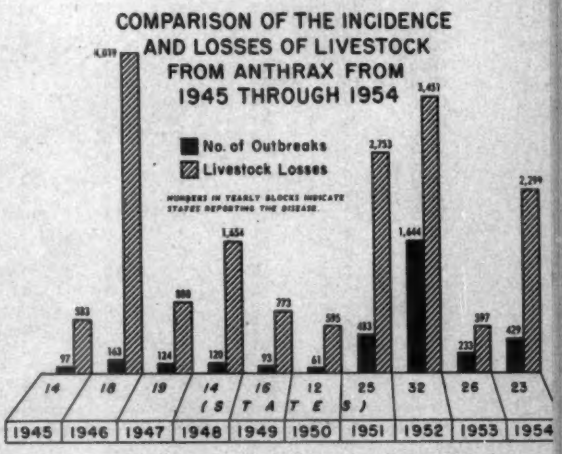
With the exception of two major outbreaks with heavy losses that occurred in Louisiana in 1946 and 1948, most that occurred from 1945 through 1950 were sporadic with minor losses.

A marked increase in incidence occurred in 1951 when 483 outbreaks were reported from 25 states. The greatest losses were reported from southeastern Missouri and adjoining areas along the Mississippi River in Kentucky and Tennessee where 302 outbreaks with losses of 1,152 head of livestock occurred. For the first time in more than 20 years anthrax also appeared in Florida when 21 outbreaks were reported from three countries with a loss of 206 cattle.

An unusual feature of the disease in 1951 was the heavy losses in swine reported from Illinois, Iowa, Kentucky, and Missouri. The outbreaks of undetermined origin that occurred chiefly in swine in Illinois, Iowa, Indiana, and Ohio in nonendemic areas were also of special significance and interest since they appeared to form a pattern of what was to occur in the early part of 1952 in swine herds in the Midwest.

During 1952, there were 1,644 outbreaks reported from 32 states, involving 432 coun-

Graph 2.



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ties with total loss of 1,578 cattle; 1,614 swine; 20 horses; six mules and 233 sheep. Outbreaks in new areas were reported from 289 counties. The 1,644 outbreaks reported in 1952 are the greatest number ever to be recorded for any single year and exceed the total number reported for the seven previous years. This tremendous increase in incidence was due chiefly to the widespread outbreaks of food origin, with low mortality, that occurred during the first two quarters of 1952 in swine herds in the Midwest and to postvaccination outbreaks that occurred principally in cattle herds in Kansas and New Jersey.

TABLE 3. Summarized Data on Incidence of Anthrax in Livestock for 10 Years (1945 to 1954)

	No. Out-breaks	L. S. Losses*	Number of Co. Involved Old Areas	New Areas	Total
Ala.	10	30	4	0	4
Ariz.	0	0	0	0	0
Ark.	45	139	11	8	19
Cal.	271	1666	30	3	33
Col.	11	72	4	3	7
Conn.	0	0	0	0	0
Del.	0	0	0	0	0
D. C.	0	0	0	0	0
Fla.	50	359	1	5	6
Ga.	5	39	1	1	2
Idaho	0	0	0	0	0
Ill.	205	866	2	57	59
Ind.	222	325	0	57	57
Iowa	133	516	6	41	47
Kan.	368	660	0	18	18
Ky.	17	243	0	4	4
La.	413	6913	25	22	47
Me.	0	0	0	0	0
Md.	1	1	1	0	1
Mass.	1	7	0	1	1
Mich.	45	162	0	17	17
Minn.	34	72	7	6	13
Miss.	84	493	12	11	23
Mo.	267	1189	4	19	23
Mont.	2	7	0	2	2
Nebr.	56	157	16	5	21
Nev.	47	236	3	3	6
N. H.	0	0	0	0	0
N. J.	114	100	3	6	9
N. M.	7	67	2	1	3
N. Y.	46	58	16	2	18
N. C.	1	1	1	0	1
N. D.	10	53	4	4	8
Ohio	317	521	2	55	57
Okla.	19	155	1	14	15
Ore.	9	24	3	1	4
Pa.	4	17	2	2	4
R. I.	0	0	0	0	0
S. C.	1	1	0	1	1
S. D.	150	333	35	0	35
Tenn.	142	269	0	4	4
Tex.	288	1619	36	74	110
Utah	4	17	3	0	3
Vt.	0	0	0	0	0
Va.	2	6	1	2	3
Wash.	6	8	0	5	5
W. Va.	0	0	0	0	0
Wisc.	36	94	2	19	21
Wyo.	4	109	1	2	3
TOTALS	3447	17604	239	475	714

*Includes cattle, horses, mules, swine and sheep.

The low incidence in recognized anthrax districts and the occurrence of numerous outbreaks with a low mortality rate during the winter and spring in areas that heretofore have reported little or no disease were outstanding features of the anthrax situation in 1952.

Since little or no anthrax has been reported from Indiana, Michigan, Ohio, Kansas, and New Jersey during 1953 and 1954, it would appear that no serious soil infection had occurred in those areas as a result of widespread outbreaks in 1952.

Aside from widespread outbreaks that occurred in the southeastern part of Illinois in 1953 and in Louisiana and Mississippi in 1954, both 1953 and 1954, like the years of 1945 to 1950 inclusive, can be considered average anthrax years. Graph 2.

The review of the data for this ten-year period shows that one or more outbreaks were reported from each of the 714 counties located in the 39 states that reported the existence of the disease. In at least 475 of these no recorded previous history of the disease has been reported. While the outbreaks that occurred in 190 of these new counties were attributed to either food origin or postvaccination breaks, the source of the outbreaks in the other 285 counties was unknown. This indicates the need for further research to obtain more definite information on the source and spread of the disease in new areas. Table 3.

The record covering the incidence of anthrax territories and possessions from 1945 to 1954 shows that no cases in livestock were reported from Alaska and Hawaii, while 11 sporadic outbreaks with a loss of 29 cattle occurred in Puerto Rico, and two sporadic outbreaks in dairy herds occurred in the Panama Canal Zone. No outbreaks occurred in the District of Columbia during this period.

A study of the data covering the ten-year survey also indicates that under natural conditions anthrax in the United States is primarily a disease of cattle occurring chiefly during the summer season when animals are kept on pasture. Outbreaks are usually most numerous and losses of livestock from the disease greatest during the months of July, August, and September. Graph 1. Hot, dry summers, preceded or followed by heavy rains appear to favor the development of anthrax. Good examples are the severe outbreaks that occurred

following periods of drought in southern Illinois in 1953 and in southeastern Louisiana and southwestern Mississippi in 1954.

Outbreaks in horses and mules usually occur on infected premises where the disease first appeared in cattle. While sheep and goats are highly susceptible, comparatively few outbreaks in these animals are reported in the United States. While a few outbreaks in sheep with moderate losses have been reported from Illinois, Kansas, Louisiana, Michigan, and Mississippi, the greatest number and heaviest losses have been reported from California. The approximate percentage of losses in the different species during the past ten years are cattle 64%, swine 19%, horses and mules 12%, and sheep 5%.

Anthrax outbreaks of food origin which may be observed anywhere at anytime occur chiefly in swine during the winter season when large quantities of mixed feeds are being fed. Many that occur in swine result from feeding on the carcasses of animals dead of the disease.

Outbreaks in Animals Other Than Livestock

During this ten-year period, nine outbreaks in mink with a total loss of 860 animals were reported from the states of New York, New Jersey, Minnesota, and Wisconsin. The source of infection in all of these was traced to feeding contaminated meat.

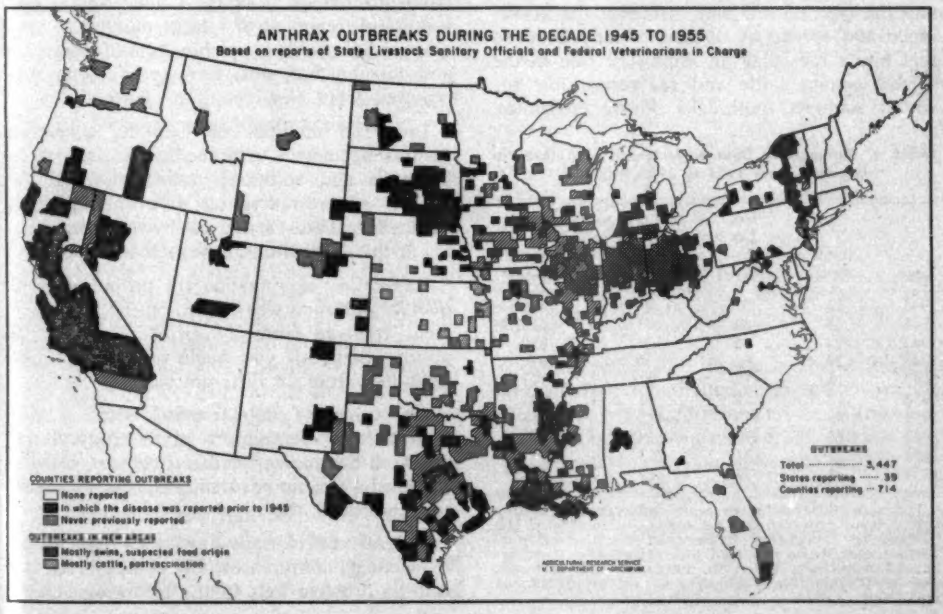
In addition to the outbreak in 1954 in the Woodland Park Zoo in Seattle, an outbreak occurred in 1947 in the Highland Park Zoo, Pittsburgh, Pennsylvania in which three buffalo were reported to have died of anthrax[10]. Outbreaks in deer were reported from Florida in 1951 and from Louisiana in 1954. Cases in farm dogs were also reported from Illinois and Mississippi.

Cases of Anthrax in Man During the Ten-Year Period 1945-1954

Thirty-four cases of agricultural anthrax in man were reported to the Agricultural Research Service in connection with outbreaks occurring in animals. At least eight of these occurred in veterinarians, two in laboratory workers handling specimens from infected animals, and the remainder in agricultural workers. During the same period, records of the U. S. Public Health Service[11,12] indicate that a total of 483 cases were reported in man. Most of these were of industrial origin occurring in persons engaged in the processing of wool, hair, hides, and other animal products in industrial plants located chiefly in some of the New England states, New York, New Jersey, and Pennsylvania. See table 5.

Records of the Meat Inspection Branch, Agricultural Research Service indicate that at establishments operating under federal meat

Map 2.


ANTHRAX OUTBREAKS DURING THE DECADE 1945 TO 1955
Based on reports of State Livestock Sanitary Officials and Federal Veterinarians in Charge
COUNTIES REPORTING OUTBREAKS
None reported
In which the disease was reported prior to 1945
Never previously reported
OUTBREAKS IN NEW AREAS
Mostly swine, suspected food origin
Mostly cattle, postvaccination
OUTBREAKS
Total 3,447
States reporting 39
Counties reporting ... 714

inspection throughout the United States 639 hogs and 40 cattle, including those showing spore vaccine lesions, were condemned for anthrax from July 1945 to December 1954, inclusive. A study of this data indicates that the rate of condemnations, especially in swine, correlates closely with the prevalence of the disease. A marked increase in condemnations usually follows severe outbreaks, such as occurred in swine herds in 1951 and 1952 when a total of 427 swine carcasses were condemned.

Other Activities of the Agricultural Research Service Associated with the Anthrax Problem

During the past ten years the former Bureau of Animal Industry and the Agricultural Research Service have been engaged in a number of activities concerned with more effective measures for the control of the disease.

Considerable valuable information was obtained during field investigations in anthrax areas in California, Florida, Louisiana, Mississippi, Nebraska, and South Dakota.

During these surveys practicing veterinarians, state and federal veterinarians, as well as livestock sanitary officials, were questioned concerning their views on the prevention, control, and spread of anthrax.

Most veterinarians contacted were of the opinion that one or more of the following factors: Weather conditions, floods, improper disposal of carcasses, flies, crows, buzzards, and the type of soil may influence the occurrence and spread of disease. Many believed that biting flies play an important role in the spread among cattle and are responsible for widely scattered outbreaks during epidemics.

TABLE 4. Summarized Data on Incidence of Anthrax in Livestock from 1945 to 1954 inclusive

Year	States rept.	No. Co. Involved	No. Outbreaks	Livestock Losses*
1945	14	52	97	583
1946	18	82	163	4,019**
1947	19	65	124	880
1948	14	63	120	1,654**
1949	16	57	93	773
1950	12	55	61	595
1951	25	113	483	2,753
1952	32	432	1,644***	3,451
1953	26	121	233	597
1954	23	74	429	2,299**

*In some states losses were estimated. **Heavy losses were reported during severe epizootics of the disease in Louisiana. ***Greatest number of outbreaks ever to be reported due principally to widespread outbreaks in swine herds in the Midwest and postvaccination outbreaks in cattle in Kansas and New Jersey.

Some veterinarians considered undernourishment and dehydration in range cattle during long, dry, extremely hot periods as contributing factors. In some areas, it was pointed out that outbreaks for the most part occur on heavy gumbo soils and rarely on sandy soils unless they are adjacent to low-lying ponds and water holes. Some infected farms were cited where outbreaks have occurred at irregular intervals for more than 25 years.

For prophylactic vaccination in known anthrax areas, spore vaccines of different types administered intradermally or subcutaneously are most commonly used. Anthrax bacterins are used only to a limited extent. For immunization in exposed herds or at the beginning of an outbreak intradermal spore vaccine or anthrax antiserum in combination with anthrax spore vaccine is administered.

A new type anthrax spore vaccine developed in South Africa by Sterne[13,14] that is prepared from nonencapsulated, dissociated anthrax organisms was recently introduced into this country. Excellent results have been reported following the use of this vaccine in South Africa, England, and India, but to date it has been limited in the United States.

During the past decade, antibiotics have largely replaced anthrax antiserum for treatment. Excellent results in the treatment of infected livestock in the early stages of the disease by penicillin therapy have been reported from different parts of the United States. The successful treatment of a large number of vaccine anthrax with a combination of penicillin and terramycin,® and terramycin alone was reported from New Jersey by Bailey[15].

Improved methods of handling suspected anthrax specimens and facilitating laboratory diagnosis and additional information on the tenacity of anthrax spores were obtained during investigations carried out by research workers in the Agricultural Research Service[16-19].

Laboratory examination for the presence of *Bacillus anthracis* was carried out on 262 specimens received from 24 different states. A positive diagnosis was made on 155 of those submitted from 20 different states.

On request of state livestock sanitary officials, federal veterinarians of the Agricultural Research Service engaged in field service have rendered valuable assistance in the diagnosis and control of the disease.

Federal veterinarians have also participated in meetings, conferences, and symposia on the anthrax problem held in the following places:

Sioux City, Iowa — May 23, 1946
Yankton, South Dakota — March 25, 1949
New Orleans, Louisiana—November 19, 1947
New York, New York — March 15, 1946
Jacksonville, Florida — April 18, 1951
Ottawa, Kansas — June 11, 1952
Washington, D. C. — March 27, 1952
Bartow, Florida — August 28, 1952
Atlantic City, New Jersey — June 26, 1952
Louisville, Kentucky — October 30, 1952
Austin, Texas — April 14, 1953
Philadelphia, Pennslyvania — October 8, 1954

The annual preseasonal vaccination of cattle on Indian Reservations in South Dakota inaugurated in 1939 has been carried out annually up to the present time. During the ten-year period, 1945 to 1954, a total of 100,686 head of Indian-owned cattle were vaccinated intradermally with anthrax spore vaccine under direct supervision of field veterinarians of the Agricultural Research Service. Since little or no anthrax has occurred on these reservations, it is believed that the annual vaccination procedure has prevented occurrence and its spread to adjacent areas.

Regulations, Recommendations, and Educational Activities for Control of Anthrax

The livestock sanitary officials and livestock sanitary associations in recognized anthrax areas have conducted an active educational campaign during the past several years for better disease control. They have emphasized the value of annual, preseasonal vaccination for prevention and stressed the importance of strict quarantine, proper carcass disposal, and the full cooperation of livestock owners.

In at least four states (South Dakota, Nebraska, Nevada, and Louisiana) an annual reminder is mailed to livestock owners in infected areas early in the year urging that animals be vaccinated before being turned on pasture or before the advent of hot weather. The Livestock Sanitary Committee of Sioux City, has given special attention to this subject and published considerable information on prevalence, prevention, and control. A pamphlet entitled, Anthrax Control in the Northwest, sponsored by this committee and approved by the Anthrax Study Committee was circulated widely among livestock producers in South Dakota, Nebraska, Minnesota, and Iowa.

Following widespread outbreaks in swine herds in the Midwest during the first quarter of 1952, and the postvaccination outbreaks that occurred in Kansas and New Jersey following the use of certain lots of anthrax bacterin, special action was taken by livestock sanitary and public health officials to combat the disease and prevent its spread.

Ways and means of combatting the disease were discussed at meetings held on March 27, 1952 in Washington, D. C., and on June 26, 1952 in Atlantic City, New Jersey. Members of the United States Livestock Sanitary Association representing many states and officials of the United States Department of Agriculture, the United States Public Health Service, the Food and Drug Administration, and the Civil Defense Administration participated and several resolutions concerning the problem were passed resulting in the following measures designed to assist in control:

1. The regulations of the Animal Inspection and Quarantine Branch of the Agricultural Research Service covering importation of bone meal have been amended to prohibit admission of so-called raw bone meal for use in either fertilizer or feed; however, special steamed bone meal (degelatinized, heat treated at sufficiently high temperatures to assure destruction of spores) is still permitted entry. All imported animal bones must be consigned to an approved establishment for further processing, the adequacy of sterilizing equipment being determined by this Branch.

TABLE 5. Reported Cases of Anthrax in Man, United States 1945-1954**

Year	Number of Cases
1945	40
1946	40
1947	69
1948	60
1949	54
1950	49
1951	60
1952	47
1953	45
1954	19*
Total	483

*Preliminary total—subject to correction
**From reports of U. S. Public Health Service, National Office of Vital Statistics[11,13].

2. The Biological Products Inspection Section of the Animal Inspection and Quarantine Branch has required producers of anthrax bacterin to increase the number of animals used in safety tests and to increase the holding time of safety tests to a minimum of 60 days. If any test animal dies during this period, it must be established that death was not caused by the product.

3. Many states have passed laws regulating

operation of rendering plants and feed-mixing plants, and requiring that all bone meal and other animal products used in fertilizer or feeds be heat-treated at sufficiently high temperatures to destroy anthrax spores.

4. The United States Public Health Service, with the assistance of the former United States Bureau of Animal Industry, the Federal Food and Drug Administration and the Federal Civil Defense Administration has prepared specific regulations endorsed by cooperating agencies in relation to anthrax in dairy herds. These have been recommended for inclusion in the Milk Ordinance and Code of the United States Public Health Service as applied to anthrax. They have also been approved by the United States Livestock Sanitary Association. Copies of these recommendations were sent to all state and territorial milk control authorities and others concerned on February 4, 1953.

5. Special committees on anthrax appointed by the United States Livestock Sanitary Association and the American Veterinary Medical Association to study the anthrax problem have made specific recommendations for its future control. The reports of these committees were published in the Proceedings of the 56th Annual Meeting of the U. S. Livestock Sanitary Association,[20] and the Proceedings Book of the American Veterinary Medical Association 90th Annual Meeting[21].

Summary

Results of nation-wide survey to determine the incidence of anthrax in livestock in 1954 indicate that 429 outbreaks were reported from 23 states, involving 75 counties, with a loss of 1,740 cattle, 123 swine, 103 sheep, and 333 horses. Aside from Louisiana and Mississippi where numerous outbreaks with heavy losses occurred most were sporadic, occurred in old anthrax areas, involved principally cattle, and losses were comparatively small. Outbreaks in new areas were reported from eight states. One outbreak in a Zoological Garden with a loss of 24 wild animals was reported from Washington state.

The incidence of the disease in animals and man from 1945 through 1954 is reviewed briefly and reveals that during this ten-year period 3,447 outbreaks were reported from 39 states with losses of 17,604 head of livestock.

Outbreaks in new areas were reported from 34 states involving 475 counties.

During this ten-year period nine outbreaks occurred in mink with a loss of 860 animals and two outbreaks occurred in zoo animals with a loss of 27 animals.

At establishments operating under federal meat inspection 639 hogs and 40 cattle including those showing spore vaccine lesions were condemned for anthrax from July 1945 to December 1954, inclusive.

Thirty-four cases of agricultural anthrax in man, eight of which occurred in veterinarians were reported from 1945 to 1954. The U. S. Public Health records for the same period reported a total of 483 cases in man.

Activities of the Agricultural Research Service relative to the anthrax problem are discussed briefly.

New regulations, recommendations and educational activities for control of anthrax are set forth.

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(Continued on page 610)

Dr. J. V. Lacroix

Small-Animal Practice

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ANY comment on the progress that has been made in small-animal practice in the United States during the past 50 years may well be considered in three periods: The first period to begin soon after the turn of the century and end shortly after World War I; and World War II may mark a point between the second and third periods.

It is not intended here to do more than to mention persons, factors, and events as these have been related to the growth and development of small-animal practice in the United States. Only brief reference is made to the role of our fine veterinary colleges in promoting progress in this field. If the schools had done no more than to afford a general course of instruction in veterinary medicine, graduates with aptitude could have qualified in small-animal practice by taking special courses and by internship. In the past, state supported schools could not expect subsidy for training "dog and cat doctors." Little need be mentioned here regarding the role of the veterinary journals. Publications here and abroad have contributed regularly to progress in this field. Any studious examination of library files will afford details on the subject.

*Publisher — Editor, *North American Veterinarian.*

First Period

During the earlier portion of the first period approximately 85% of the population of the country was rural. Comparatively few dogs were kept in city homes. Farm dogs, to a considerable degree, earned their keep and farm folk in general had problems which they considered vastly more important than the health of their dogs and cats. Moreover, with few exceptions, veterinarians who were practicing in the country were neither in-

Dr. Arthur Trickett

terested in small-animal practice nor too well qualified to engage in the work when invited to do so. As indicated in a brief reference to Dr. Arthur Trickett[1] when he was showing dogs in this country and in Canada before and at the turn of the century, " . . . he was seldom fortunate in obtaining the services of veterinarians who would look at a dog. Most of them were afraid of dogs and knew little about them either in health or in disease."

During the greater part of the first period we examine, neither the activities of the American Kennel Club nor those of other organizations had popularized dogs to any great degree beyond urban areas. Only a small number of veterinarians gave any considerable portion of their time to small-animal practice and few of these hospitalized dogs and cats. In fact, many well qualified veterinary practitioners, during much of this period, did not feel complimented when their horse-owning clients requested them to give attention to ailing dogs. In such instances, attention given to a dog or a cat was usually gratuitous.

[1]Reflections, Arthur Trickett. *N. Am. Vet.*, 36:98, 1955.

Second Period

The second period began in the early 1920's. Mechanical traction was threatening the use of horses and mules for farm work as well as in the cities. Practice was changing and veterinarians who did not adapt themselves by preparation to meet these changes, suffered the consequences if they stayed in practice. Those in the country who had occupied themselves largely with equine practice began seriously to give attention to the affections of meat-producing animals. In the cities, canine practice began to receive the attention of most veterinarians. And commonly, as the files of veterinary journals for the period indicate, the subject "Small Animal Practice" appeared in many regional veterinary programs.

During a part of this period of development, the influence of one man was directly and indirectly responsible for progress in small-animal practice to a greater degree than the sum total of all other factors. That man, Dr. J. C. Flynn, gave the better part of two years of his time, without compensation, in criss-crossing the country by automobile accompanied by Mrs. Flynn, in response to invitations extended by the secretaries of veterinary organizations, small and large. Doctor Flynn was a successful practitioner in the treatment and hospitalization of small animals at Kansas City, Mo. He was a capable and versatile exponent of demonstrational methods and wherever he gave clinical demonstrations, attendance was good and interest high. His sutureless technic for spaying puppies, created

Dr. Joseph C. Flynn

Early animal ambulance (1917) employed by Doctor Flynn of Kansas City. Hospital in background.

of economic necessity in his practice, was something of a sensation as he executed this operation. He was, therefore, in great demand and demonstrated this operation and gave instruction at meetings throughout the United States and parts of Canada. With an unusual background of experience in small animal practice, a good speaking voice, and a ready wit, Doctor Flynn quite naturally encouraged hundreds of veterinarians to engage in small-animal practice.

At the annual meeting of the A.V.M.A. at Columbus, Ohio, in 1920, Dr. F. H. Miller of New York City reported on the diagnosis of whipworms in dogs wherein he employed microscopic examination of fecal specimens. Doctor Miller also reported on the treatment of the condition by ablation of the cecum. Naturally this lent impetus to the employment of microscopy in the diagnosis of intestinal parasiticism in dogs and cats. In 1924, Dr. Frederick Whipple of Peoria, Ill., was employing the method reported on by Doctor Miller for the treatment of whipworm infestation. Dr. L. A. Merillat of Chicago gave assistance for the improvement of the surgical technic to the end that a satisfactory percentage of recoveries from this operation, in the Whipple practice, resulted. About that time, Whipple was employing endoscopy in his practice but this work did not yield the results expected; however, it focused attention on this sort of exploration of parts of the bronchi, the stomach, and the lower bowel.

During the early part of this period, there was comparatively little information offered on many subjects which now are well understood. Medical research wherein dogs were employed as subjects had not yet yielded much helpful information. To a considerable extent internal medicine was conducted on an empirical basis in small-animal practice and, on this unchartered course, there was not too much agreement between practitioners. For instance, one school of thought was that digestive disturbances were sure to result whenever anything but raw beef was fed to dogs. Few veterinarians thought of the existence of cystitis in cases of incontinence and little attention was given to urinalysis. Norms had not yet been established to guide any who might have attempted to make use of the clinical laboratories in blood work. Radiography was employed by a few men for locating foreign bodies and in fracture work but many more employed fluoroscopy instead. But, thanks to a number of earnest, energetic pioneers during this period, a mass of sound clinical information was obtained and recorded in American literature. Upon this foundation, the superstructure of new knowledge, contributed by workers within and without the profession, was built.

In February 1926 and again in 1927, Dr. J. C. Flynn was the moving spirit in offering a course of special instruction to veterinarians who were interested in small-animal practice. This instruction was given at Evanston, Ill., at the North Shore Animal Hospital, and consisted of lectures and clinical demonstrations given by a group of well qualified veterinarians. Forty-three veterinarians coming from many parts of the country took this intensive two-week course of instruction.

In 1933, the idea of an organization of veterinary practitioners who were attempting to improve methods in the hospitalization and treatment of small animals was proposed. This resulted in the creation of the American Animal Hospital Association, which organization has contributed greatly to progress. The idea, however, met with vigorous opposition among some influential members of the American Veterinary Medical Association. One reason given for this opposition was that it would "kill the section on small-animal practice in the A.V.M.A." The reply was that it would "make a success of that section" — and it did. From the outset, the A.A.H.A. set a pace in programs that compelled emulation. Early features encouraged the use of clinical records and stressed their importance; clinical laboratory methods and their indications; nutrition of dogs; food testing; the treatment of fractures; and sterile technics in surgery.

At this time versatile practitioners collaborated with manufacturers in producing appliances of various kinds for use in the new and growing field of practice. This included suitable operating tables, cages, carrying containers for small animals, surgical instruments and apparatus.

The construction of buildings especially designed for the hospitalization of small animals has contributed much to progress in small animal practice. Probably the first to provide facilities for the care and treatment of pet animals on this continent was Dr. Duncan McEachran, at Montreal — about two decades before the turn of the century. In subsequent years veterinarians here and there provided modest facilities for the treatment of small animals, chiefly dogs. But, it was Flynn who set an example by offering hospital facilities in

a good building especially designed and constructed for the purpose at 3026 Main Street, Kansas City, Mo., before World War I. A few other veterinarians followed shortly but it was not until the late twenties and early thirties that many well constructed hospitals providing facilities for the hospitalization and treatment of small animals were available. Hospital construction continues and this activity is not limited to any period.

Third Period

The third period began with the conclusion of World War II. Despite the demoralizing influence of this war on civilization in general, one segment of small animal practice was given impetus because of the war. The youth of our country, while serving overseas had ample occasion to think of home and all that made home attractive in contrast to their surroundings. Home included one or more family pets and these pets were the objects of solicitous inquiries in letters which thousands of parents received. As a result, geriatric practice began to supplant euthanasia.

Obviously no clear-cut distinction is to be made between the second and third periods of progress as considered in the foregoing. Most events leading to marked improvement in methods and materials employed are the result of the development of ideas, of laboratory contribution and field trials. Therefore, progress continues: In the use of anesthetics; in the application of knowledge regarding water balance; in nutritional requirements and improvement in the therapeutic use of diets; in the field of pathology; in the application of clinical laboratory determinations; in chemotherapy with some degree of specificity in the use of many new therapeutic agents; in a better understanding of most parasitisms; in all branches of surgery including orthopedics, and invasion of the thoracic cavity; in radiography and in the employment of radiant energy for therapeutic purposes; in the study of ophthalmology and cardiology; and in the prophylactic use of biologic agents. Readers are well aware of the character of this progress and it requires no elaboration here.

(*Continued on page 604*)

Expanding Knowledge Of Viruses

JAMES A. BAKER,* D.V.M., Ph.D., Ithaca, New York

ONE of the most prolific and thoughtful veterinary writers of the past 50 years was Dr. D. Arthur Hughes. Some quotations are worthwhile from an article called, What Investigation Is, first published in 1905.

"At any moment in the history of any single science there is always a body of facts or principles or laws which have been put through the fire of tests in continued experiment or observation and, as a result, scientific men have come to the conviction that they are truths in that science. The eminent bacteriologist, Dr. Veranus A. Moore, has given the term 'dead wood' to such facts, meaning that they are settled as facts. Yet the statement of fact even here is not unalterable; nor, on the last analysis, can it be said that any fact or body of facts is beyond dispute; for everything in science can be questioned by any other investigator, and the discovery of new facts often requires that old facts be restated in the light of later discoveries . . .

Dr. James A. Baker

"There are three classes of workers in science: Those who aim to discover truths of nature, who make it their vocation by patience and persistence to unfold the truths of nature; those who lay hold of and disseminate these truths, whose vocation is to teach the truths obtained by the investigators; those who lay hold of the truths and apply them in the trades, in the manufacturers, in the mercantile arts, in the scientific professions for personal aggrandizement, for the safety, comfort or luxury of mankind. We in America are so carried away with joy in our material progress, largely obtained by the application of scientific knowledge to practical utility that we are apt to forget the obligations we owe to the . . . toilers in scientific research. . . . We ignore the work of the researchers at our peril, for any advances in . . . scientific fact must always antedate their application . . . Scientific investigation in a branch of veterinary science is the ardent pursuit, by whatever method, of new facts in that science. . . . Even though the results of a piece of research may be negative, the work was none the less an investigation while the scientific temper prevailed."

Developing Knowledge

In 1955, the veterinary profession realizes more fully than in 1905, the necessity for carefully controlled research by trained veterinary scientists interested in the welfare of the profession. They know that just as disease results from cause and effect, that valuable scientific findings are also the result of cause and effect. The cause for such research is the necessity for finding accurate answers to questions that bother the practicing veterinarian. The effect is an answer that helps him in his practice.

Certainly, before knowledge can be accumulated there must be a focal point about which to accumulate it. For virus diseases, this all

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Electron microscope in use at Cornell University. This instrument is maintained in the Physics Department but is available for use by other departments in the various colleges in the university.

began with the recognition of a disease principle, thought at that time to be fluid. A substance had been found, after passing through filters that retained bacteria, that produced disease in tobacco plants. It could not be seen under the microscopes then available. A few years later, first with foot and mouth disease, followed over the years since then by more than a hundred others, agents called viruses have been defined as causes of diseases in plants and animals.

In itself, the discovery of the cause of a disease proved a primary step in accumulating further information about that cause. Once the cause of a disease had been determined and defined to some extent, it could be discussed among a group of people, then sent from one scientific laboratory to another for still further study. Development of knowledge about that particular disease agent was assured. On the other hand, unless the discoverer of a particular virus could keep strains alive for confirming comparison studies by others, then, for practical purposes, no definite discovery has been made.

This has proven the case in many instances. In my own work just prior to World War II, for example, a virus was isolated and shown to be the cause of a pneumonia in calves then occurring in New Jersey. Almost simultaneously, on farms where there were sick calves, cats showing respiratory distress also yielded a virus. These viruses proved to be different serologically. In any case, both strains were stored in celluloid tubes under dry ice with hopes that they would survive the war. The cat virus did, but the calf virus did not, perhaps because carbon dioxide lowered the pH and destroyed the calf virus. Today, we have a great mass of information about the cat virus, now called *Myagawanella felis*. But other than knowing that a virus once upon a time produced pneumonia in calves, we know nothing further because the strain is gone. Work concerning its isolation was published before the long storage made necessary by the war years. Today, it might be better for our body of knowledge if no publication had been made. A primary aim and responsibility of all who seek knowledge about viruses, and have the opportunity to isolate a new one, is to maintain that virus for further study by responsible workers. Different people have varied ideas and will use numerous technics in their search for knowledge.

All advance of knowledge about viruses has rested primarily on application of technical procedures. In this, there has been free borrowing from all fields of the natural sciences. In their initial discovery, viruses were thought to be fluid, yet today we know them to be particulate and, in fact, because of electron microscopy recognize a great diversification of size and shapes. Where, therefore, would our knowledge of viruses be without the realization that viruses possess form, consisting of particles capable of multiplying and thereby increasing in numbers. Obviously, it is this knowledge of an infective multiplying unit that forms a rational basis for live virus vaccines. Of course, small pox vaccination was common practice before there was any knowledge of viruses, but it does not follow that there could be similar naturally modified hog cholera vaccines. In the instance of cow pox virus protection against smallpox, an acute observation was applied with all the mystery of the universe, whereas the hog cholera vaccines were first made and then used with human knowledge of the principles involved.

Over the years, as more and more viruses were isolated and their pathological effects studied, it was soon realized that although their effects on different cells were variable, they were relatively constant for each disease. Some viruses stimulated only proliferation such as papillomatosis, others were initially proliferative but finally produced degeneration,

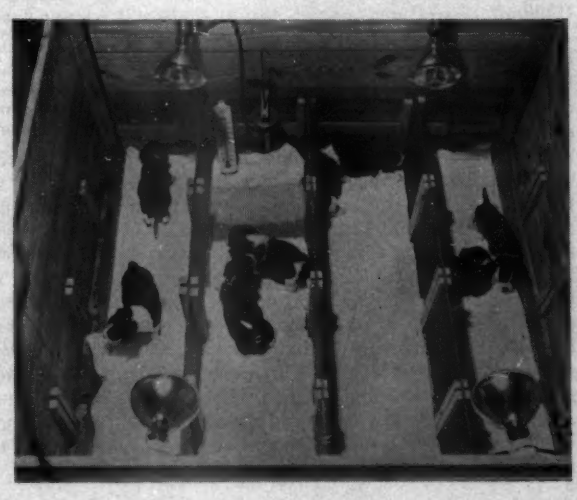
such as the pox viruses. The rabies virus initially caused neuronal degeneration. Some viruses produced inclusion bodies, visible under the microscope, such as the Negri body of rabies. Being distinctive, these were most helpful in diagnosis. Clinical pathology contributed knowledge, especially the depressive effects of viruses on the number of circulating leukocytes. Descriptive pathology, both gross and microscopic, for each particular virus was of great aid in its recognition and, thereby, of help in assaying incidence. Recently, introduction of thin tissue slices, suitable for examination under the electron microscope, holds exciting promise of providing still more information about the reaction of cells invaded by viruses.

The field of immunology stabilized originally on certain technical procedures based on bacteria. Some of these were applied to viruses. These serological methods soon proved of value in viral studies, especially neutralization. The virus neutralization tests then were standardized. When used with care, they were found to be highly specific for each virus. Serological methods today still prove helpful, not only as aids to diagnosis and to identification, but lately are used as tools whereby changes in the constitution of certain viruses, especially foot and mouth disease virus, are recognized.

Viruses represent a positive quantity in that they are something acquired by an animal, although they negate health. Since they are definite entities, relatively simple to remove from an infected animal, hold in a test tube for a time, and then be transferred to another animal, it was only natural that curiosity about them would lead to investigation of what was in the test tube. Consequently, technical procedures flourished, aimed at purification, determining physical and chemical properties and at changing them into either more or less virulent forms. Given a problem, scientists showed their ingenuity and with technics adopted from chemistry and adapted to viruses, eventually purified some and finally photographed them by use of the electron microscope, which, incidentally, was provided by physicists. We now know much about viruses, or at least they are sufficiently understood to have an accepted place in the biological scheme of things. Probably, in terms of philosophy, they are just as mysterious as ever, yet knowledge does bring a familiarity that dispels mysticism and provides an outlet for scientific effort.

Of course, final precise knowledge about the effects of a virus on either its natural host or on other animals in host range studies, can only be done by exposure of animals under completely controlled conditions. When this has not been done, erratic and at times inaccurate information has been obtained.

Certainly, Laidlaw and Dunkin began their work on canine distemper naively as many others had before, under what was considered usual conditions. In their work, they had clean, immaculate animal rooms, carefully separated by wooden partitions. Soon their experimental animals became sick, whether inoculated or not. Accurate testing proved impossible until they constructed sealed rooms, and laboriously evolved a procedure that would



Puppies in incubator. These puppies were removed at birth from infected mothers and immediately placed in the incubator. Heat was supplied under themostatic control to maintain a temperature of 90 F. Puppies were fed milk substitute. Note their vigor and well being. Such puppies are disease-free and when placed in isolation units make possible a study of factors influencing viral infections.

not transfer distemper virus from animals on one test to animals on other tests.

Their technic for controlled studies on animals, afterwards largely ignored for awhile, has in recent years been adopted in a number of new animal research centers in this country. They should bring to the profession an ever increasing accumulation of accurate information, by avoiding unplanned infection after animals are placed on experiment.

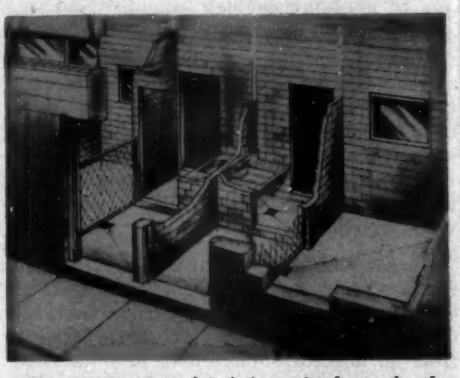
However, it has been recognized that individual animals can vary in their response to a given dosage of a virus and that a number of different factors can influence this response. At the Veterinary Virus Research Institute at Cornell, in our studies on hog cholera infection in pigs, we now know that age, immune status of the mother, and the nutritional background are all necessary considerations for any study. The result of animal research must be stated in terms of these factors, at least. Since these factors can influence, unless controlled, in infections with mild effects, inapparent infections and immune reactions would appear similar in an animal test. A finding from uncontrolled tests would depend on the opinion of the worker and would have no scientific value. We have developed, therefore, animal disease research to a more accurate understanding of factors influencing each animal's response. No longer is an animal suitable for study. Although obtaining and then rearing disease-free animals, providing facilities and food for them, in addition to keeping accurate records of age and other data, all create a further burden on animal research centers, unless provisions can be made to do this, much misleading information will result.

As our fund of information increases from improved technical procedures and newer knowledge, conclusions based on earlier technics sometimes appear inadequate. Certainly, earlier investigators should not be considered inaccurate in their observations, for their result was obtained by the methods then used. But new technics expand knowledge and, in accounting for more factors in a complex situation, such as must exist in an animal response to a disease producing agent, conclusions must be expected to alter. Unfortunately, it may seem to some as if the foundations of our knowledge are insecure if they are subject to reinvestigation, and especially if newer knowledge alters an existing practice. Except for a brief feeling of loss as an old concept gives way to a new one, progress should be the end result, and our beliefs strengthened. Veterinary science needs more, not less, research to accumulate more knowledge for firmer foundations.

Using Knowledge

Acquisition of knowledge for its own sake is an attribute of the human mind. With a few men, this knowledge is used for the betterment of man. Ever since certain viruses were discovered, the means whereby they were spread determined and principles of immunity found, there has been tremendous effort to make effective use of this information.

Veterinarians in daily practice saw hope for preventing certain diseases. Where, heretofore, there had been no hope, vaccines and sera could be administered with knowledge that the remedies offered rested on a firm scientific basis and with certain limitations could be recommended unreservedly to livestock owners. A new era was here. There was



Cut away section of isolation units for study of animals exposed to infectious agents. Each unit is a 3 room suite, 1 for change of clothes, the other for maintaining equipment, while the large room is for test animals. These units prove successful in that infectious agents do not spread from an inoculated animal, meaning, of course, that animals do not contract unplanned infection, thus permitting accurate observations on the course of disease.

a demand for products and in response to this need, a new industry came into being. Biological houses, strategically located to ship their products to the purchaser swiftly, were organized. In keeping with progress achieved through research, newer and better products have been their aim. Slowly but surely, out of a seemingly chaotic profession, especially the confusion caused by horse replacement and channeling of veterinary practice to care for other domestic animals, a fine balance of organization and cooperation has been achieved between the veterinarian, researcher, and com-

(Continued on page 604)

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The Use Of The Ophthalmoscope in Veterinary Practice

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AN increasing degree of interest in veterinary ophthalmology has become apparent in the last several years. More attention is being focused on examination of the eye as an aid to diagnosis, particularly through observation of changes in the posterior part of the eye, or fundus. It is with the technics involved in this examination that this paper is concerned.

The beginning ophthalmoscopist will experience little difficulty even in his initial observations of the fundus. He enters his studies endowed with a knowledge of the structure and functions of the eye, knows at least the principles of physiologic optics, and has available as reference a literature rich in clinical material and illustrations.

It was not always so.

In the beginning, the ancients believed that the bright glow of an animal's eyes at night was due to a hidden, built-in light source which permitted the beast to see in the dark. That this was a property of the living eye was easily demonstrated — when the animal died, the light went out.

Later, when man became more philosophically inclined and was wont to attach special purports especially to things unknown, he believed that a visual spirit, or even the soul, was contained within the eye. But Cicero said, "It is the soul itself which sees. The eye is but the window to the soul."

The eye was dissected many times and even the tapetum was observed, but no one attached any visual significance to the tissues at the base of the globe — at any rate not until much later, in 1704 when Jean Méry immersed a historically important, but ill-fated cat in a tub of water, and, looking through its dilated pupils, saw for the first time the fundus picture of a living eye.

The problem of a less dire means for examination of the fundus now arose. Immersion of a patient in a tub of water obviously presented some difficulties. Possibly light could be thrown back into the base of the eye by holding a candle in front of the pupil, but unfortunately the flame got in the way. If the candle was held behind the examiner's head to get the flame out of the way, no light was available.

These practical problems proved difficult of solution until 1851 when Helmholtz placed a slide-mirror arrangement obliquely in the light from a candle, and thus was able to direct a beam through the pupil onto the retina.

Since that time, innumerable improvements were made, and the opthalmoscope has assumed almost every conceivable form in its evolution. The modern instrument of today (fig. 1) is a simple modification of Helmholtz' early slide (fig. 2).

*The Armour Laboratories, Chicago.
The author is indebted to the Scientific Division of The American Optical Company, Buffalo, N. Y., for their cooperation in supplying the illustrations used in this paper.

The Eye

The posterior segment of the eye includes three layers: A firm, opaque, outer coat, the sclera; a middle vascular layer, the choroid; and an inner, transparent, light-sensitive tunic, the retina.

Within the choroid is a peculiar, lustrous structure, the tapetum, which occurs in all domestic animals except the pig. Its color varies between species, and is usually a combination of blue, green, or yellow. It is not possible to visualize a tapetum in puppies younger than four weeks, but development begins about this time and is complete in about five months. The tapetum acts to collect and concentrate the light passing through the retina reflecting it back to the retinal receptors, thereby reinforcing light perception necessary for vision in dim illumination.

Slightly medial to the central axis of the eye is the optic disk, the point of entrance and exit of nerve fibers from and to the brain. Radiating out of the center of the disk are a number of arteries and veins which form the vascular supply to the retina.

The Ophthalmoscope

There are many types of opthalmoscopes available, all of which accomplish the objective of illuminating the retina.

Figure 3 is a schematic diagram illustrating the principal parts of the instrument. Arranged around the periphery at A are a number of concave and convex lenses of increasing strengths and an open aperture. The selected lens has the function of magnifying the fundus image while correcting for the refractive anomalies which may be present in the patient's or observer's eyes. The proper lens positioned in the viewing aperture will bring into focus a clear image of the patient's fundus. A+40 D† lens will be found helpful as an illuminated magnifier for examination of the anterior parts of the eye: Cornea, iris, and anterior chamber.

The fundus is illuminated by light which passes through a condensing lens system, B, into a prism or mirror, C, which deflects the beam through the patient's pupil onto the retina. The examiner sights through a viewing aperture, E, and observes the fundus.

Some instruments contain a series of masks or filters, F, which permit changes in the size, shape or character of light admitted to the retina. In addition to the normal aperture, there

†D=Diopter, the unit of lens power. 1 diopter has a focal length of 1 meter.

Fig. 1. The electric ophthalmoscope.

is a pin hole useful in examination of the contracted pupil, a grid which permits comparison of size of retinal objects against the optic disk, a red-free filter which darkens and enhances the visibility of blood vessels and retinal hemorrhages, a yellow filter which increases visibility of retinal detail and a slit aperture for examining surface irregularities.

Use of the slit aperture is of practical value in the opthalmoscopic examination. It is well known that a slit of light will run in a smooth, uninterrupted, straight line, when focused on a flat surface, but where concavities or convexities exist, the light will bend down into or over the top of the irregularity.

The characteristic ophthalmic feature of glaucoma is increased intraocular pressure. This pressure is often sufficient to result in the head of the optic nerve being pushed back toward the brain, thereby depressing the disk. The light slit focused across the normally flat nerve head will bend down into the cavity revealing the "cupping".

On the other hand, when increased intracranial pressure produces edema of the nerve head, it results in protrusion of the disk into the eye. The slit of light focused across the disk will now show the elevation on the fundus.

The terms "papilledema" or "choked disk" are used to identify this swelling of the nerve head caused by pressure from a variety of causes, among them brain tumors, brain abscesses, vitamin A deficiency or skull fracture.

Examination of the Eye

The beginning ophthalmoscopist will do well to commence his studies of the ocular fundus by careful examination of the textbook plates illustrating the normal retina, and those which depict the physiologic variations from normal. *These pictures should be studied through an opthalmoscope.* There is a very real value in combining the hand, eye, and instrument, and this technic affords, in addition, attainment of proficiency in the use of the instrument.

The student would then be advised to examine as many human eyegrounds as possible which will result in an easy familiarity with the instrument and the details of the retina so important for future clinical work. The observations should be compared with textbook illustrations and their explanatory legends. There are a number of such books available, among them May's Diseases of the Eye (Williams and Wilkins, Baltimore), or Gifford's Textbook of Ophthalmology by Adler (W. B. Saunders and Co., Philadelphia).

In animals it is often difficult to maintain a constant view of the fundus, because they may try to continually shift their vision. This may be obviated easily by having an assistant hold the lids apart, and press slightly with his finger against the lateral side of the eyeball to prevent movement. Care must be taken not to exert unnecessary pressure.

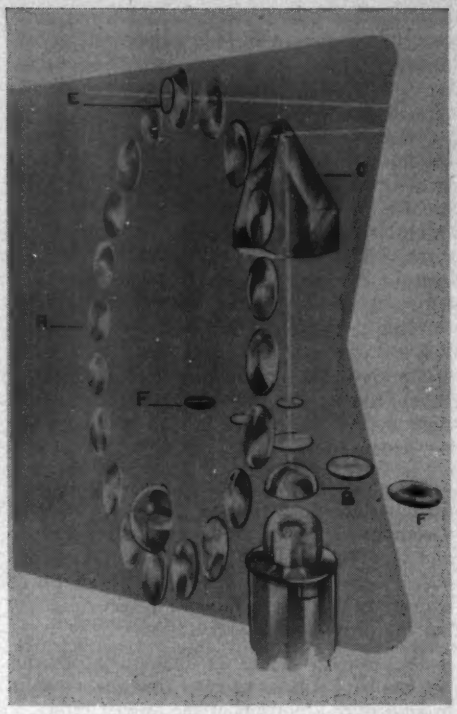

Fig. 3. The functional parts of an ophthalmoscope. (For description see text).

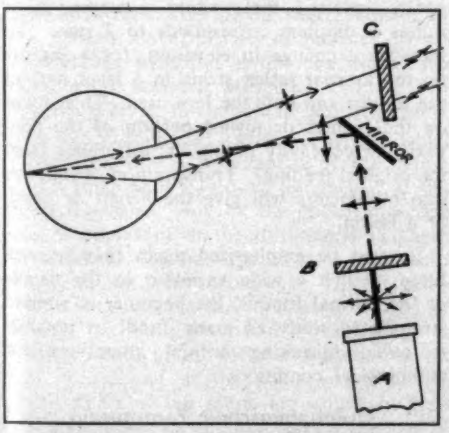

Fig. 2. Schematic diagram illustrating illumination of the retina by the ophthalmoscope. The light from the ophthalmoscope at A passes through a series of collecting lenses at B. The beam is reflected from a mirror or prism through the patient's pupil onto the retina. The examiner sights through the aperture in the instrument head at C to observe the illuminated fundus. In Helmholtz' original method, a candle provided the light source.

It is occasionally desirable or advisable to dilate the pupils for more adequate examination. Some dogs, the Collie in particular, have small pupils, and thorough observation of the retina is difficult. In these instances, a mydriatic, a drug which effects pupillary dilation, may be used. One or two drops of 1% homatropine hydrobromide are usually sufficient to produce mydriasis. At the conclusion of the examination, this effect may be neutralized by the instillation of one or two drops of 1% pilocarpine.

To begin the examination, the observer should rotate the milled disk on the ophthalmoscope head until the zero, or open aperture, is in the sight hole, and the light turned on. With the instrument held in the right hand and placed close to the right eye, direct the beam from a distance of about 6 to 12 in. onto the

pupil of the patient's right eye. A red choroidal or a greenish tapetal reflex will be observed. Taking care to maintain the reflex, move in as close as possible to the eye. The retinal vessels and the optic disk should now be visible. If they are not, various lenses should be rotated into position until the image is sharply in focus. The dog is uniformly myopic, a condition in which the observed image is focused on a point in front of the retina rather than directly onto it. If the degree of myopia is about 3 diopters, a -3 D lens will be required in the viewing aperture to bring the retinal details into clear view, but this will vary according to the observer's vision and power of accommodation. The examiner should always use his right eye to study the right eye of the patient, and his left eye for the patient's left eye.

No amount of description can picture adequately the animal fundus. The most amazing variations are apparent in health and disease and it will be only after considerable experience has been gained through examination of many eyes that one will begin to recognize any but the gross abnormalities.

The general details of the animal fundus are similar to those of man, but the tapetum extends over a portion of the animal retina.

As the optic disk forms the first point of orientation on the fundus, it is well to begin the systematic study here. The disk is normally round or slightly oval with sharply defined edges, pinkish in color and situated about 1-3 mm. medial to the center of the eye. The disk normally lies flat against the retina, but there may be a very shallow, pale depression in the center from which the blood vessels arise. This depression is referred to as the "physiologic cup," and must be differentiated from the deep cupping seen in glaucoma.

The arrangement of the retinal vessels is markedly inconsistent and varies even between opposite eyes. They are easily distinguishable as arteries and veins, the arteries being a lighter red with a definite, bright reflex stripe down the middle, and the veins somewhat darker, usually showing no continual reflex stripe. The veins are larger than the arteries in the proportion of about five to four. The retinal artery and vein divide within the optic nerve giving off their branches from the center of the disk where they supply the entire retina. Normally, the course of the vessels is smooth and even, with no signs of tortuosity. Both arteries and veins cross one another frequently, and are intimately connected with each other, the connective tissue coat of one vessel often fusing with that of the other. Occasionally, pulsations may be noted, more common in the veins than in the arteries. Marked arterial pulsation is a sign of some importance, occurring frequently in glaucoma, cardiac disease, and profound anemia. There are more retinal vessels in the horse than in other animals; the significance of this is not understood.

Over an upper portion of the retina the finely stippled, brilliant blue-green or yellow tapetum lucidum is visualized. It has been stated that the color of the tapetum may be associated with hair coloring. Dapple colored dogs, such as the dappled Dachshund, always have an anomalous tapetum, while in albino dogs, no tapetum is present.

The tapetum nigrum is situated in the lower portion of the fundus and is dark brown or black in color. Over the non-tapetal portions of the retina, the fundus is a uniform pink or red.

The extent of any lesion may be estimated by several ophthalmoscopic methods. Most practically, the size may be compared in terms of disk diameters, estimating the disk at about 1.5 mm. in width. The comparison may be measured fairly accurately when the grid light is used in the ophthalmoscope. Changes in the level of structures in the fundus, such as tumors, cupped disk or papilledema are measured in diopters. An elevation of plus 3 diopters equals 1 mm., while a depression of minus 6 diopters corresponds to 2 mm. To measure a change in elevation, focus sharply on the arterial reflex stripe in a level part of the fundus and note the lens used. Then focus on the highest or lowest portion of the convexity or concavity noting the difference from the original reading. Transposition of diopters into millimeters will give the height or depth of a lesion.

It must be emphasized again that because there is such a wide variation in the details of the normal fundus, the beginner is advised strongly to study as many fundi as possible to avoid mistaking normal alterations for pathological conditions.

Ophthalmoscopic Features in Disease States

Hemorrhage in the retina is not uncommon, and may occur as a result of trauma, but is especially marked in obstruction of the retinal vein or one of its branches. Retinal hemorrhages take on a rather characteristic appearance depending upon their location. Hemor-

rhages in the superficial layers of the retina often lie close to and follow the path of the nerve fibers approaching the disk and are termed striated or "flame shaped". The hemorrhages become absorbed slowly, the smaller ones leaving little or no trace of their presence, the larger ones being replaced by connective tissue. Glaucoma, vitreous opacities, or detachment of the retina may occur following these large hemorrhages.

While obstruction to the retinal vein results in numerous hemorrhages, closure of the retinal artery results in stoppage of the blood supply to the retina followed by edema. The fundus is strikingly pale with marked narrowing of the retinal arteries. The area about the disk shows marked pallor. Characteristic of this condition is the "cherry red spot" in the macula, the area of most acute vision in the eye. Closure of the central retinal artery results in quickly developing blindness in the affected eye.

It has been said that glaucoma occurs most frequently in Wirehair Terriers and Cocker Spaniels. As a result of the increasing intraocular tension, a depression or cupping of the disk is seen which will have very steep or overhanging margins. The blood vessels bend sharply over the rim of the excavation, often appear interrupted, and then are seen again more or less faintly at the bottom of the cup. The veins are distended and the arteries contracted. There is pulsation in both veins and arteries at the border of the disk. Pressure on the eyeball may be used to produce or accentuate the pulsation in this condition. The optic nerve becomes atrophied and the disk appears pale, or in the late stages, very white.

A fairly common, serious condition which affects the eye is detachment of the retina, which may be a cause of blindness. It can be distinguished only by the ophthalmoscope, and is important in the differential diagnosis of blindness. Retinal separation is most commonly of the spontaneous type which is associated with myopia and a history of trauma. It will be remembered that the retina is attached only at its peripheral inserts at the ora serrata and at the point where all the nerve fibers of the retina are united to form the optic disk. In all other areas, there is no firm adhesion between the retina and the choroid, but only a simple contact produced mostly by pressure of the vitreous. It is important to know that retinal detachment occurs without pain. Without intervention, an eye affected by a detached retina is condemned sooner or later to more or less complete blindness. As soon as the intimate contact between the retina and the pigment epithelium covering the choroid is disturbed, the red or green reflex in the pupillary space becomes mixed with grey, and is in quantitative proportion to the degree of the detachment. Ophthalmoscopically, the detached retina appears as a grey veil with folds which may be mobile and floating, and dark blood vessels are seen which are dilated and tortuously bent. By careful and thorough examination, a tear will be seen in the retina, usually at the periphery, through which the choroid is visible. In the great majority of cases, untreated detachment becomes total. The extension may develop slowly or rapidly, and finally the only points of attachment are at the ora serrata and the disk. Early recognition of this important condition is of the utmost importance if the eye is to be saved. The surgical treatment of detachment is outlined in any textbook of ophthalmology, recovery usually being effected in about half of the operated cases.

A condition of progressive retinal atrophy, believed to be hereditary, has been described. It apparently occurs mostly in Irish Setters, Gordon Setters, and yellow Labrador Retrievers although other breeds may be affected. At about six to eight weeks of age, affected pups exhibit an increase in reflectivity from the tapetum which is a brilliant green. This is quite strikingly seen in dim light, and night blindness is observed in the animals. There is a progressive loss of vision so that the animal eventually becomes blind in the daytime as well. It is believed that distemper or other infections may hasten development of the condition. As the animal becomes older, the owner becomes impressed by a widely dilated pupil which eventually fails to react to light, and the noticeably bright green reflection. Ophthalmoscopically, the tapetum loses much of its granular stippling or beadiness, and is greener than normal. There are noticeable changes in the blood vessels . . . the larger ones becoming markedly reduced in diameter, and the smaller ones fine and thread-like, eventually becoming invisible, the picture resembling that seen in closure of the retinal artery. The disk becomes greyish and pale with a blurred margin. The entire retina gives the appearance of being hazy.

Another retinopathy has been described which appears to be associated with encephalitis. Ophthalmoscopically, it resembles the picture seen in progressive retinal atrophy, but there is a greyish-white reticulum which covers the tapetum becoming more and more

dense until the tapetum is completely hidden from view. Over the non-tapetal retina, irregularly scattered patches of black pigment are seen surrounded by greyish-colored zones. Retinal detachment is often seen in these cases, and is caused by the presence of a bullous type edema. In severe cases, the retina becomes completely detached with associated loss of vision.

Discussion

Veterinary ophthalmoscopy is a comparatively new discipline, and many important diagnostic signposts have yet to be described. Most of our present information comes from the wealth of human literature on the eye; however, the recent, ready availability of the retinal camera for study and cataloging of fundus changes in the eye, and the simplicity of operation of the ophthalmoscope, will certainly result in increasing contributions to the veterinary ophthalmoscopic literature.

Advancement in this field will not depend on cloistered research, but on the interest and willingness of the veterinarian in practice to study with the ophthalmoscope every patient coming under his care; to scrupulously record his observations in both normal and abnormal conditions, and be particularly alert to note any retinal changes which occur with some constancy *preceding* the onset of disease symptoms. Finally, the practitioner must describe his findings for dissemination in veterinary literature.

With a little practice one can become skilled in the use of the ophthalmoscope, and as examination of the heart and lungs with the stethoscope, of the mouth and throat with the tongue blade, and of the ears with an otoscope are of prime importance in diagnosis, so too should careful study of the eye with the ophthalmoscope form an integral and routine part of the examination of all patients.

Small Animal Practice

(*Continued from page 594*)

Perhaps it is appropriate here to touch upon leaders and leadership in our profession. While men have changed little in the past fifty years, the methods they employ have changed considerably, due chiefly to the influences to which we have been subjected. During the first decade of this century leaders in the veterinary profession were largely Europeans or Americans who had received a part of their training in Europe. Those leaders did not interfere with prompt and direct action such as that which followed occasionally when veterinarians violated ethical codes. Today, action is cautious, often indirect, and there is usually "a friend in court." Today our leaders are Americans who have taken advantage of the abundant opportunities that exist for graduate study, here, where facilities excel. As a result, there are now proportionately fewer outstanding leaders than formerly, but because of a larger number of well qualified leaders, leadership is of excellent quality and the profession is being guided sagely.

Because of the recent great shift in population to urban and suburban areas in this country, vast growth in small animal practice and hospitalization has resulted. Forms of group practice are in operation. In time, this will result in good record keeping among those who now devote little effort to this important aspect of practice, and a sound and broad basis for recording further progress in this branch of practice will follow.

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Knowledge of Viruses

(*Continued from page 598*)

mercial organizations. There is mutual respect and appreciation for the common goal.

Veterinarians in practice must do something positive for animal production. In order to do this effectively, they must have their problems solved by research workers. Solutions of veterinarian's problems almost invariably lead to the need for some effective drug or vaccine. Here, applied science takes over from the research laboratories and assures the veterinarian in practice of the best that can be produced. This cooperation among the groups has been helpfully integrated by the fine veterinary education evolved in this country, by various governmental agencies at both state and national levels and the good efforts of the American Veterinary Medical Association. It would be difficult to conceive how virus research could have made its contribution without veterinary organization as it is.

It can be stated, without question, that we have the health of animals today because information from research has been properly applied and understood by animal owners who cooperated. These gains have been great, yet only a beginning has been made. The 50 years just past have been good.

A Preliminary Report On The Use Of Nitrofurantoin In Treatment Of Canine Tracheobronchitis (Kennel Cough)

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TRACHEOBRONCHITIS variously referred to as kennel cough, tracheitis, or chronic bronchitis, is an ever constant problem for the practitioner interested in treatment of pet animals. It is characterized by a dry harsh cough, occurs in paroxysms and is followed by a retching or gagging motion, which is usually nonproductive of mucus.

Owners will, in many instances, be firmly convinced that the patient has something caught in its throat. Gentle pressure on the trachea or larynx will produce the characteristic cough in most cases. The temperature is usually normal to slightly elevated and the onset is sudden.

Brucella bronchiseptica and *Streptococcus canis* are cultured frequently from the throat, but reproducing the disease in experimental animals with these organisms has failed thus far. In kennels, the condition appears to be quite infectious and may reach epizootic proportions. It is, however, frequently observed in house pets that have little opportunity for exposure to other animals.

In the past, treatment has been relatively unsuccessful. Cough depressants such as codeine, dilaudid, and morphine are prescribed frequently. Antibiotics, especially chloromycetin®[1] and other broad spectrum antibiotics have been employed for treatment. Bacterins containing killed *B. bronchiseptica*, streptococcal and staphylococcal organisms and pertussis vaccine have their advocates among specialists in the field. Administration of organic iodides and vitamins and nursing, and proper hygienic measures are prescribed regularly.

The policy in our clinic has been to treat referred cases as suggested above, but in most instances the disease usually would run its course in from two or four weeks. Mortality is rare among such patients presented at the Kansas State College Clinic. Nevertheless, the disease causes much suffering among the canine population and considerable concern to dog owners. For this reason, it was thought advisable to search for new remedies that might prove effective.

Furadantin®[2] (brand of nitrofurantoin or 5-nitro-2-furfurylidene aminohydantoin) is a synthetic antimicrobial drug which has attained widespread usage recently in human medicine, especially in urinary tract infections[1,2]. Good results with furadantin also have been reported in other inflammatory conditions such as septicemia, empyema, and wound infections; including those caused by organisms resistant to antibiotic therapy[3]. To our knowledge there are no publications on the use of this agent in veterinary medicine, although related nitrofuran drugs are reportedly used with success as topical antibacterials in canine otitis,[4,5] bovine mastitis,[6] and demodectic mange in dogs[6]. The drug has also been used perorally in hepatic and intestinal parasitisms in poultry[7]: In view of the rapid bactericidal action of furadantin on many pathogenic bacteria,[3] it was decided to try the drug in contagious canine tracheobronchitis.

Furadantin was dispensed on June 28, 1955 for use in treating a dog suffering typical syndrome. The patient was a Labrador-cross, weighing 60 lb. Cough had persisted for two days. Temperature was normal. Furadantin was prescribed at the rate of 1.66 mg. per lb. of body weight three times daily (eight-hour intervals) for a total dosage of 300 mg. per day. The owner reported that the cough had nearly disappeared within 48 hours after medication was initiated and that after 72 hours was nonexistent.

Since July 27, 11 additional cases of typical tracheobronchitis have been treated with this preparation, using from 1 to 2 mg. per lb. of body weight three times daily. With one ex-

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®[1]Parke-Davis Co., Detroit, Mich.

®[2]Furadantin used in this study was furnished by Eaton Laboratories, Norwich, New York.

ception* cough had disappeared in 72 hours. In this one instance, the owner reported that the patient was greatly improved but still coughing two or three times a day on the fourth day. Inquiry on the seventh day revealed that the cough had disappeared and the dog recovered completely. Thus far there have been no recurrences following recovery. Treatment administered for four days was followed by outstanding results in all cases.

While only a few cases of canine tracheobronchitis have been treated with furadantin thus far, it is felt that the favorable results obtained justify publication and further trials on a more extensive basis.

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*Number 4 in the table.

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Egyptians deified the cat and elevated it to the rank and rights of royalty circa 3000 B. C. They believed the cat's eyes varied in appearance with the course of the sun and moon.

Herodotus recounts several instances of the Egyptian's exaggerated regard for their domestic felines. He tells us that when a cat died, the Egyptians shaved off its eyebrows, and in the event of fire, were more anxious to save their cats than to extinguish the flames.

At death, these cats were duly mummified and entombed. Their bodies have been uncovered by the score, and 90 have been presented to the British Museum. Examination reveals that they differ little from the modern cat.

TABLE 1. Dogs with Tracheobronchitis Treated with Furadantin

No.	Patient	Age	(lb.)	Temp. (F.)	Coughing (Days)	Results
1	Labrador-Cross	4	60	101.8	2	Cough absent in 3 days
2	Mongrel	11	25	102.8	3	Cough absent in 2½ days
3	Terrier	1½	12	102.8	3	Cough absent in 3 days
4	Boxer	8 mo.	40	101.8	7	Coughing 2 or 3 times a day on the 4th day
5	Terrier	6	22	102.3	2	Cough absent on 3rd day
6	Doberman	2½	14	102.0	2	Cough absent on 3rd day
7	Mongrel	4	25	102.5	3	Cough absent on 4th day
8	Mongrel	5	35	103.0	4	Cough absent on 3rd day
9	Pointer	2½	45	103.0	1	Cough absent on 3rd day
10	Boxer	3½	60	101.8	2	Cough absent in 2½ days
11	Shepard	4	50	102.0	2	Cough absent on 3rd day
12	Cocker	2	25	102.6	3	Cough absent on 3rd day

Note: More recent inquiry in eight of the twelve cases brought forth the information that dogs remained healthy and the cough did not recur. Four owners did not respond to the inquiry.

Role Of Beta Hemolytic Coliform Organisms In Edema Disease Of Swine

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INVESTIGATIONS directed toward determination of the etiology of edema disease of swine have been carried on for some 17 years. Little progress has been made, although Timoney[1] and Lamont[2] have successfully reproduced the disease by the intravenous injection of intestinal fluids from diseased specimens. On the basis of experiments conducted by these investigators, it is obvious that the condition is a toxemia resulting from the absorption of toxins present in the alimentary canal.

For some time it has been the writer's opinion that edema disease is a syndrome resulting from the absorption of specific toxins elaborated by specific microorganisms in the digestive tract. These may be unusual inhabitants which on becoming numerous could produce a sufficient quantity of toxin to produce lethal effects if absorption is accomplished. The organisms also could be normal inhabitants which, under certain conditions, become toxigenic, or they normally could be toxigenic with the toxins being able to pass the mucosal intestinal barrier only under certain abnormal conditions.

With the above hypotheses in mind the writer set out to determine whether any organisms might be present in greater numbers in the intestinal tracts of edema disease carcasses than in normal pigs or in those dying from other conditions.

Investigations of the Intestinal Flora of Edema Disease Specimens

In the fall of 1954, a dead pig from a herd where edema disease was reported to be occurring was presented for autopsy. This pig, in addition to other lesions, exhibited massive edema of the stomach wall. Sections of the small intestine, about 10 in. in length from the fore, middle, and distal portions, were tied off and removed. Into each section was injected 10 ml. of nutrient broth, which was then withdrawn. This was seeded to blood agar plates which were incubated at 37 C. under anaerobic conditions in a Brewer jar. Observations at 24 hours incubation indicated that the predominant organism (estimated 90%) was one producing beta hemolytic, circular, translucent colonies about 1-2 mm. in diameter. At first it was believed that these were Clostridia, but further study indicated them to be organisms of the coliform group. When grown under aerobic conditions there was produced larger, opaque colonies which were less hemolytic than when grown under anaerobic conditions.

Within a few days of the above isolation an edema disease carcass from another herd was investigated. Bacteriological examination yielded beta hemolytic coliforms in essentially pure culture. Bacteriological studies have also been conducted upon animals from three other herds where edema disease was definitely incriminated. In two of the outbreaks beta hemolytic coliforms were barely predominant in the intestinal cultures, while in the third, these were the only organisms present as judged by the technic employed.

Investigations of the Intestinal Flora of Normal Swine and of Those Dying From Causes Other Than Edema Disease

The small intestines of 14 specimens which had not died of edema disease were cultured in the manner described. These included three pigs which had died of pneumonia, one which had died of a ruptured liver, one dead of a ruptured aorta, one normal pig accidentally killed, two normal butcher hogs, five pigs from three herds where the cause of death could not be determined, and one pig that died of pulmonary edema. Except for one pig that died of pneumonia, all cultures were negative for beta hemolytic coliforms. The cultures from this animal showed few beta hemolytic coliforms colonies. The animal dead of pulmonary edema yielded almost pure cultures of alpha hemolytic coliform colonies. The cultures of the other pigs were essentially pure cultures of ahemolytic coliforms with a few

colonies of what appeared to be *Clostridium perfringens.*

The Action of Beta Hemolytic Coliform Toxins on Pigs and White Mice

Following isolation of the first hemolytic coliform strain the organisms were seeded to nutrient broth containing 3% peptone and 1% glucose and incubated for 12 hours at 37 C. Additions of NaOH were made every 15-30 minutes to maintain the hydrogen ion concentration at approximately pH 8.0. The broth was then centrifuged and the supernatant treated with trypsin for one hour at 37 C. Immediately following this procedure two pigs were injected intraperitoneally with 2 ml. and 10 ml., respectively, of the trypsinized supernatant. The pig receiving 2 ml. immediately showed signs of distress and lay down. The respirations were labored and rapid. Ten hours later this pig was found dead. An autopsy revealed hydrothorax, hydroperitoneum, hyperemia of the lymph glands, a full stomach and relatively empty small intestine, and a slight subserosal edema about the pylorus. The other pig did not develop symptoms and remained normal.

Another pig was given, orally, 10 ml. of a broth culture. Seven days later this animal was found dead. Autopsy revealed marked edema of the thoracic musculature and an area of edema in the gastric wall. The small intestines were relatively empty although the stomach was full of feed. Cultures of the visceral organs were negative. The intestinal tract was not cultured.

Each of two pigs was injected intraperitoneally with 10 ml. of the non-trypsinized supernatant of a 12-hour broth culture. Both pigs developed marked dyspnea and became depressed. One pig died within 12 hours while the other was depressed and would not eat for 24 hours following the injection. The gall bladder of the dead pig appeared markedly edematous. In addition there was an area of subserosal edema between the pylorus and cardia on the small curvature of the stomach.

After a two week interval the live pig referred to above and one other were each injected with 10 ml. of the non-trypsinized supernatant of a 12 hour culture. The pig previously injected did not develop symptoms while the other became quite ill and would not eat for about 18 hours.

In another experiment cultures from the last outbreak were used. Following 12 hours incubation the broth was passed through a Seitz filter, and 10 ml. of the filtrate was injected intravenously into each of two pigs. Neither animal developed symptoms. In other experiments, pigs were dosed orally with broth cultures of the isolated organisms. Symptoms were not elicited. Approximately 24 white mice were injected either I.V. or I.P. with supernatants of broth cultures or with filtrates without symptoms occurring.

In attempts to reproduce edema disease with beta hemolytic coliform organisms isolated from the intestines of swine, it appears that one must carry out experimental procedures without delay, for the organisms lose their hemolytic activity within a very short time when carried on artificial media. Within two months following isolation all of the strains had practically become ahemolytic.

Summary

Cultures of the small intestines of edema disease specimens from five different outbreaks revealed beta hemolytic coliforms to be the predominant organisms. Similarly prepared cultures from 14 non-edema disease carcasses failed to reveal such organisms except in one instance where proportionally they were few in number. A limited number of test swine developed marked symptoms following the intraperitoneal injection of supernatant fluid from broth cultures of beta hemolytic coliform organisms. Two animals died as a result of the injections.

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Survey of Anthrax

(*Continued from page 588*)

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Pregnancy Examination Of Range Cows

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UNDER conditions of our present economy, it is imperative that we produce various commodities as economically as possible in order to maintain a competitive position in our respective industries. With this axiom in mind agriculture, particularly animal husbandry, is applying scientific facts and procedures to its operations in an effort to increase efficiency and economic returns to the grower-investor. As veterinarians, we are in a position to offer additional services that are beyond the scope of strictly "emergency" or "therapeutic" practice, to further this increased efficiency. Among these additional services are preventive vaccination programs, internal and external parasite control as a continuous program, et cetera, not to be used in the face of clinical problems but to anticipate and prevent clinical or subclinical manifestions of infection. The field of nutrition as related to health, avitaminosis, mineral deficiencies, and toxicities, and in beef cattle pregnancy examination and the examination of the genital tract of nonbreeding cows are services of value to the livestockman. This service has been recognized as an economic need by many progressive dairymen and dairy cattle practitioners but it has been neglected by the beef industry as a whole. It is finding increasing favor in the entire cattle industry. The operation can be performed easily and promises to be of significance economically. Examination can be as complete as the owner and the veterinarian think advisable. The

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Pregnancy examinations of all cows, as well as open heifers, in the breeding herd at Fall round-up time furnish a valuable culling yardstick. An appropriate squeeze chute and experienced hands facilitate examination of large numbers of females daily.

following can be determined on rectal palpation: (1) Pregnancy; (2) approximate age of fetus; (3) condition of ovaries (if nonpregnant); (4) condition of uterus (if nonpregnant).

The logical time to perform this service in this area is in the Autumn during Fall roundup time. It is at this time that all the cattle are gathered, calves weaned, the cows culled, and the herd shaped-up for the following season.

Almost all beef cattle operators have a schedule or plan of culling the cow herd that controls the conformation, age, and condition of that herd. There are many also who have established policies on production. Many factors and personal opinions dictate decisions. All cows without calf at side may be culled from one herd, while in another such animals may be held over in the breeding herd. Of course, any of these policies are flexible depending, to a great extent, on the vagaries of weather, prices, feed, et cetera. So it is usually feasible to add another factor, that of pregnancy, to our culling yardstick. It is obvious that a certain number of cows that will be culled should be sold due to physical condition alone, regardless of the status of the reproduction cycle. Then there will be a group (much larger) that, if pregnant, could be retained in the herd economically, while if not pregnant, would just be an added expense with no expected income for the coming year. These may be culled if not pregnant. Young cows or first calf heifers that have not been in calf may be culled if examination indicates the probability of their being barren cows. Removing these open animals from the breding herd will increase the percent calf crop and the efficiency of the operation. Also, the buyer of cull cows for slaughter will be inclined to pay a higher price because he will not have to make allowances for the shrink in weight due to the loss of fetus on slaughter.

If open cows are culled before the winter feeding period, a saving can be effected on the feed bill for each one culled. This is the simplest approach economically. The following table is illustrative of potential savings under a rational system of culling:

Original Situation.	
1,000 cows—130 replacement heifers (carrying capacity of range)	
85% calf crop = 850 calves	
Sell 850—130 = 720 calves at $20. x 3.5 cwt. = $70. x 720 =	$50,400.
	9,100.
	$59,500.
Culling barren cow program.	
950 cows—180 replacement heifers (adjusted carrying capacity due to heavy culling replacements)	
95% calf crop = 900 calves	$50,400.
Sell 900—180 = 720 calves at $70./hd.	
Sell 180 cows (culls) at $70.	12,600.
	$63,000.
Increase in revenue, checked herd	$3,500.
Cost of herd checking: Expense-veterinary service at $1./hd.,	950.
2 days, 5 men at $8./day	80.
	$1,030.
Net increase due to checking	$2,470.
Net increase per calf	$3.50

In addition to the obvious economic savings, it is entirely conceivable that there are other rewards to this practice not immediately apparent. These include the potential of selection away from shy and poor breeder, for genital health, longevity, and other desirable factors.

Also, handling these cows individually at this time makes it possible to check and treat many other conditions that might otherwise be overlooked, *i.e.* condition of teeth, external parasitism, misshapen or misdirected horns, beginning cancer eye, to mention a few. In addition to the few advantages mentioned above, the individual veterinarian and owner will probably be able to think of many more to be gained by this examination.

In performing pregnancy examination in range cows, I find that a good chute and cattle squeeze are essential to a fast, smooth working operation. We catch the cow's head in the headgate and close the squeeze just enough to steady her (not tight). An assistant elevates the tail straight up, not to either side, while rectal examination is made. This is a must. With a good corral crew and some experience, one can examine these cows at the rate of one animal per minute.

Pasteurization of milk drew attention of all in 1911. Said Governor W. D. Hoard of Wisconsin, "I prefer milk that has always been clean to the product that has been made clean."

According to Adamnan, a world-wide animal epidemic raged in the year 684. It persisted for three years and destroyed most of the farm animals.

Yesterday, Today, And Tomorrow In USDA Livestock Regulatory Activities

C. D. VAN HOUWELING,* D.V.M., Washington, D. C.

THE 50th anniversary of a magazine—as in the life of a man—is an important event. It is an occasion for remembering the past, appraising the present, and taking a look into the future.

Those of us in the livestock regulatory programs of USDA's Agricultural Research Service have a special interest in the golden anniversary of VETERINARY MEDICINE. The magazine has recorded much of the history of these programs. It has been a sounding board for new ideas on their extension and improvement. And its editorial support has helped to obtain professional backing for legislation needed to make federal regulatory activities an increasingly valuable public service.

Dr. C. D. Van Houweling

Remembering the Past

The USDA Yearbook for 1905 gives an interesting picture of some of the influences that led to the establishment of VETERINARY MEDICINE.

It was a period of economic expansion. "Another year of unsurpassed prosperity to the farmers of this country," the Yearbook noted.

The livestock industry was booming. "Farmers' horses have never before been so numerous, nor in the aggregate so valuable. First threatened by the bicycle, and later by the electric trolley car and the automobile, neither one of these, nor all combined, have scared the farmers' horses into diminished numbers or lower prices. On the contrary, horses on farms last winter were worth $1.2 billion or nearly as much as the corn crop this year. Their number was over 17 million. Mules also are increasing and are worth $352 million."

"Milch cows also are advancing in numbers and have reached a total of 17.5 million. Other cattle, however, have not participated in this advance. Last winter they numbered 43.7 million, worth $662 million."

A few pages further on, the Yearbook carried an account of the activities of the Bureau of Animal Industry, which by then had been in existence for 21 years.

Early in that period, Bureau veterinarians had waged a successful campaign to eradicate a disease in cattle that imperiled the livestock export trade and was a threat to domestic production. This was contagious pleuropneumonia—eradicated in 1892 after a five-year fight at a cost of $1,500,000.

But the campaign that had star billing in the 1905 Yearbook was a more recent one—the eradication of foot-and-mouth disease following an outbreak in New England in 1902.

By July 1903, when the quarantine was lifted from the port of Boston, federal veterinarians had supervised the slaughter of nearly 4,000 cattle and, in addition, a number of other animals exposed to the disease. The federal government had paid $128,000. in indemnities.

"It would be impossible to commend too highly the fidelity and energy with which the force of the Bureau carried on the work of eradication in spite of many difficulties," the Yearbook noted. "This campaign against a

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contagious animal disease stands unrivaled if we consider the celerity, the economy, and the satisfactory results of the work."

Along with these dramatic campaigns, Bureau veterinarians and the research workers on the team were moving ahead on many fronts in their war on livestock diseases.

If VETERINARY MEDICINE had maintained a Washington office in 1905, the tip sheets during the year would have undoubtedly featured the following stories in the making:

1. Increased Evidence of Unsanitary Conditions in Packing Plants and of the Need for USDA Authority to Supervise Meat Handling in the Plant.

"The subject of meat inspection grows in importance every year," according to the Yearbook. "It is not too much to assert that upon the success of this branch of our work depends a foreign trade worth many millions of dollars yearly to our stockraisers."

By the time this edition of the Yearbook was off the press, a new novel had focused attention in a highly dramatic way upon the existence of certain unsanitary conditions in packing houses. The Jungle, by Upton Sinclair, turned public interest upon a situation that had already been thoroughly studied by USDA officials.

In his biography of Tama Jim Wilson, then Secretary of Agriculture, E. V. Wilcox says, "As a matter of fact, since 1891, when the first meat inspection law was enacted, the Bureau of Animal Industry had been asking for authority to exercise supervision over these matters. But so far Congress had limited their powers to inspection of live animals and meat."

The ferment then brewing came to a head a few months later. Congress passed the Meat Inspection Act of 1906. Within a year the force of 300 veterinarians employed in meat inspection work in 1905 had been doubled.

2. Increased Authority to Impose Quarantine.

By 1905, federal officials were widely experienced in the use of quarantine as a measure of protection against livestock diseases. Three years before, the Secretary of Agriculture had asked for legislation to increase his powers to regulate the movement of imported livestock and livestock products across state lines. This had been granted in the Act of 1903. In March 1905, a supplement to this Act authorized the Secretary to impose a quarantine on any state or territory where contagious, infectious, or communicable diseases of livestock were found to exist.

3. The Big Push to Eradicate Scabies in Sheep and Cattle.

Scabies was among the first livestock diseases in this country to yield to the combined efforts of research, education, and regulation. Research had demonstrated that dips of either nicotine-sulfate or lime-sulfur would control sheep scabies. The technics were described in a Farmer's Bulletin released in 1898 and widely circulated among growers. A regulation requiring all sheep in interstate commerce to be dipped according to government recommendations was put into effect in July 1899. By 1905, some 17,000,000 sheep were being dipped and the incidence of scabies had reached a new low. That year, in an effort to eradicate the disease in sheep, the Bureau of Animal Industry placed 1,700,000 acres under quarantine. At the same time, the Bureau stepped up the drive to gain control of cattle scabies by placing more than 1,200,000 acres, chiefly on the western range, under quarantine.

4. Plans for an Inspection and Quarantine Program in Cooperation with the Southern States to Eradicate Ticks and Bring Cattle Fever under Control.

In the fall of 1905, Secretary Wilson announced that USDA would join the southern states in a program to eradicate tick fever. This means that knowledge developed from one of the great scientific discoveries of modern times —the role of insects in carrying disease— would be put to use on a wide scale.

It was still too early to know the full significance of these basic studies, made in the early 90's by three Bureau scientists, Dr. Theobald Smith, Dr. F. L. Kilborne, and Dr. Cooper Curtice.

In less than six years of study, these men had identified the blood parasite which caused cattle fever, and had proved that it was carried by ticks. This knowledge paved the way for research proving that insects transmitted dozens of diseases in man and animals, among them malaria, yellow fever, sleeping sickness, typhus, and bluetongue.

5. Evidence that an Effective Anti-Hog Cholera Serum Can Be Produced from a Filterable Virus.

The section of swine diseases in the Secretary's report for 1905 noted "—the very careful work of the Biochemic Division — has proved that acute hog cholera is caused by a virus which has not yet been cultivated and identified. The discovery of this unsuspected

Unloading crated animals from an international plane is a complicated and difficult task even with most modern handling equipment.

contagion has opened up an entirely new field of investigation, which is being energetically developed — which it is hoped, will throw some light on the methods of prevention adapted to this disease."

Actually, the first step toward a successful preventive had been made during the year in experiments by Dr. M. Dorset, Dr. C. N. McBryde, and Dr. W. B. Niles. The results demonstrated that hogs could be protected against cholera by an antiserum prepared from hogs that were themselves immune to the disease and that had received large amounts of blood or virus from hogs sick with the disease.

6. The Growing Awareness of the Prevalence of Bovine Tuberculosis.

The search, begun in 1905, for an immunizing agent to protect cattle from tuberculosis, ended without success the following year. It had been stimulated by increasing evidence that the disease was widespread. To quote the Yearbook, "It is not uncommon to find herds of dairy cattle where 50 to 90% of the animals are affected."

At that time there was little evidence of a relationship between tuberculosis in animals and in man. Authorities generally agreed that bovine tuberculosis would not affect the people who drank milk from infected cattle. But Bureau scientists questioned this view. Fifty years ago they were saying, "Milk of all cows which have reacted to the tuberculin test should be considered as suspicious and should be subjected to sterilization before using. Still better, tuberculous cows should not be used for general dairy purposes."

An Appraisal of the Present

Turning the spotlight from yesterday to today, we find our country once again in a period of expansion and unparalleled prosperity. Livestock plays an increasingly important role in agriculture.

Today, people of the United States are eating more meat. One reason for this is that there are more of us, and our numbers are growing. Another reason is that we are changing our eating habits. As we learn more of the value of vitamins, proteins, iron, calcium, we are shifting from the high energy foods — the sugars and starches — to the more health-protective foods — meat, milk, eggs, and the green and leafy vegetables.

The biggest increase in our diet has been in meat, poultry, and fish. Consumption of these high protein foods is up a fourth over what it was in 1935. This past year we set records in the per capita consumption both of beef — with an average of 79 lb. — and all red meats — with an average of 154 lb. per capita.

Some 95,000,000 cattle, 35,000,000 swine, 31,000,000 sheep, and around 2,500,000 goats were on U. S. farms and ranches last year.

The most dramatic change in the livestock picture since 1905 is suggested by a news note concerning the 1955 catalog of one of the big mail order houses. It reports that "for the first time in 70 years, harness for horses is omitted from the catalog." Work horses and mules have practically disappeared from the American farm as more powerful tractors, and other

farm equipment have moved into the fields to take their place.

Among headline stories on federal regulatory activities still in the news or in the making as the 50th anniversary issue of VETERINARY MEDICINE goes to press are these:

1. Foot-and-mouth Disease Eradicated in Mexico.

The Secretary of Agriculture opened the Mexican-United States border to livestock and livestock products December 31, 1954.

This marked the close of the sixth outbreak of this disease to imperil U. S. livestock since the dramatic episode reported in the Yearbook for 1905. The first four of them were in this country. Livestock regulatory officials were able to eradicate the disease after a strenuous campaign that took about two years in each instance.

More recently, the threat from this disease has been met before it reached our borders. When Mexico suffered an outbreak in 1947, our government joined with the government of Mexico in setting up a joint commission to bring the disease under control. In the five-year fight it took to accomplish this, it was necessary to slaughter 1,000,000 animals and to administer over 60,000,000 doses of vaccine. The program was concluded with the opening of the U. S. border to Mexican livestock and livestock products in September 1952.

A much smaller area was involved in the second outbreak in May 1953. By using eradication technics worked out in the first campaign, the Joint Commission was able to move in on the disease quickly.

2. Efforts Stepped Up to Eradicate Brucellosis.

Fifty years ago, livestock producers were just beginning to recognize the cost of brucellosis. Over the years the picture of these losses was brought into focus. And when the depression '30's made it necessary to reduce cattle population, livestock men suggested this be done by slaughtering cattle shown to be reactors in a widespread testing program. That was the beginning of eradication of brucellosis on a national scale. Launched in 1934 cooperatively by USDA and the states, the program involved extensive testing of herds, slaughter of reactors, and vaccination of calves. It resulted in marked reduction of infection. But when the program came to a standstill during the war years, brucellosis gained a new foothold.

Losses from the disease were estimated at $92,000,000. annually in 1946 when the program was resumed. These have continued high even though the rate of infection has been reduced gradually.

Straining Brucella Abortus vaccine. Examination of growth under violet light for purity. Animal disease laboratory, Beltsville, Md.

In October 1954, Congress gave the program new impetus by authorizing special funds ($15,000,000. annually) to expand the work over a two-year period. These funds made it possible to resume federal indemnities and they have also stimulated the expansion of state programs.

Today's efforts are paying good returns in the reduction of brucellosis infection across the country. In October 1954, only three states—Maine, New Hampshire, and North Carolina—could be described as brucellosis free. (The technical term is *modified certified brucellosis free.* This means not more than 1% of the animals are infected and not more than 5% of the herds are involved.) Three other states: Minnesota, Washington, and Wisconsin— expect to achieve this goal by June 30, 1956. Many other states are moving toward it.

Today there are 2,500,000 herds and 31,500,000 cattle under supervision in brucellosis eradication programs. There are now 71,606 certified herds, an increase of 13.4% in the number of herds in the past year. However, these represent only 1.8 % of the total herds. A tremendous job will be required to eradicate brucellosis.

3. Experience in Gaining Control of Vesicular Exanthema Brought Helpful Lessons.

The most recent survey on vesicular exanthema, a major threat to the swine industry during the past three years, indicates the disease has now been pushed back to isolated premises in six states. This was achieved through the combined forces of federal and state regulatory officials and the swine in-

dustry. It required garbage cooking legislation in 46 states to make the program effective.

One important lesson from this experience is that a disease confined to one area for many years — in this instance to California for 20 years — can spread with terrific speed to all parts of the country. During the fiscal year 1953, vesicular exanthema was reported in 42 states. It showed up in practically all of the major stockyards, demonstrating conclusively that this and many other diseases could be carried from infected premises to concentration points.

Another lesson driven home during the fight on this vesicular disease of swine is that it is possible to cook garbage in a way to take full advantage of this abundant, economical feed supply and at the same time protect swine from it and other garbage-borne diseases.

4. Inspection of Flocks for Scrapie is Paying Returns Both in Detection of the Disease and in Alerting Veterinarians to Watch for It.

Scrapie, a chronic infectious nervous disease of sheep and goats first diagnosed in the United States in 1947, is now recognized as a serious threat to the entire wool industry, but particularly to the producers of purebred sheep.

In a move against this disease, federal and state regulatory officials maintain a cooperative program of inspection, diagnosis, quarantine as required, and slaughter of all infected and exposed animals. In 1954, the regulations were revised to permit the federal government to pay indemnity—up to 50% of the difference between salvage and appraisal—without matching payments from the state. During the past year, 11 flocks in eight states have been slaughtered and today, nearly 1,500 flocks and at least 275,000 sheep are under surveillance.

5. New Vaccine Helps to Control Bluetongue.

Bluetongue, a disease of sheep that has now shown up in some 700 flocks, and 600,000 animals in ten states, is spread by small insects, the Culicoides, that have been identified in many states. Heaviest losses from the disease have been in California where it was credited with the death of 15,000 animals in 1952.

This past year, for the first time since 1948, when the disease was recognized here, U. S. sheep growers had an effective vaccine for bluetongue. This was developed in cooperative research by the Agricultural Research Service, the University of California, and industry. Four firms, licensed to produce it, have manufactured more than 2,000,000 doses and sheep growers are making wide use of the vaccine to protect their flocks.

6. Steady Progress in March Against Bovine Tuberculosis.

Since 1917, when the eradication of bovine tuberculosis was undertaken on a national scale, taxpayers have invested $300,000,000. in the fight. It is still going on. The gains have been enormous. One measure can be seen in the carcasses retained by federal meat inspectors at the packing plant on evidence of the disease. In 1916, these retentions amounted to 2.35% of all carcasses inspected. Today they are equal to 0.007% — one carcass retained for each 14,000 inspected. Lesions that show up on regular kill provide the clue for tracing sources of infection. A highly sensitive new technic — the cervical test — is now being used to good advantage in spotting reactors in herds known to be infected.

Beef carcasses bearing the "little purple stamp" and the grade designation. The former, assurance of wholesomeness; the latter, of quality. Both are applied by USDA personnel.

7. Federal Meat Inspectors Examine an Average of 400,000 Animals Every Working Day.

In fiscal 1955, U. S. meat inspectors stationed in more than 1,100 establishments in 446 cities supervised the slaughter of more than 98,000,000 animals and the preparation and processing of 16,000,000,000 lb. of meat and meat products. Their primary mission is to assure production of clean, sound, wholesome meat, free from adulteration, and truthfully

labeled. But in addition they render another great service to veterinary medicine and the livestock industry. Their position is unique for observing the presence of animal diseases and in this front line post, they regularly alert other livestock regulatory workers to threats from disease in time to move in on it quickly and efficiently.

8. Program to Detect Presence of Foreign Diseases in Livestock Being Stepped Up.

The threat from destructive diseases is always with us. We must be constantly on guard against them. The fact that the livestock industry of the United States has been spared many costly diseases can be credited to the constant alertness of men in federal animal inspection and quarantine service.

Battle clothing in the campaign against foot-and-mouth disease worn by veterinarians in Mexico. Disinfectants for clothing and premises are most important items in control of this and other vesicular diseases.

Among recent developments in this work is the inspection and quarantine of all poultry and birds brought into this country. The first regulations governing poultry were set up in June 1950 when an outbreak of Asiatic Newcastle disease occurred in game birds brought in from Hong Kong, China.

The protection of American livestock against foot-and-mouth disease, rinderpest, and other exotic diseases often raises complex problems. A recent instance is the difficulties encountered in returning 67 Charollais cattle smuggled into this country from Mexico. These cattle were brought into this country in defiance of United States regulations and a Mexican presidential decree. Our government seized the cattle and arranged to return them to Mexico after a long series of negotiations.

The job of guarding our borders from foreign diseases is made increasingly heavy by the movement of livestock by cargo plane. Today, 60% of cattle, chiefly breeding and dairy stock, exported from the United States is moved by plane.

One of the tragedies of foot-and-mouth disease.

9. Modifications in Approach to Inspection of Veterinary Biologics.

In making plans to reorganize the veterinary biologics inspection service, federal regulatory officials recognize that the procedures aimed mainly at anti-hog cholera serum and virus are no longer adequate.

Plans now in preparation take into account the enormous growth of the industry, the increasing variety and complexity of the products, and the prospect that the industry will continue to grow and diversify in coming years.

USDA's present laboratory facilities and funds are not nearly large enough for independent testing of even a small percentage of all products. The plans now under consideration redirect inspection toward quality control. That is, the new approach would give greater weight to tests made by companies with spot checks under government supervision. Some check testing is now being done under contract.

It will take a continuing training program for the inspection force to step into and carry on this new role. Plans are in the making for a program that will help inspectors keep ahead of developments in this fast-moving industry.

10. USDA Reorganization Strengthens Cooperation in Livestock Regulatory Activities.

During the past 18 months, livestock regulatory officials and other members of the staff

have learned to fit in the new organization that came with the realignment of USDA agencies in January 1954.

At that time seven bureaus, including the Bureau of Animal Industry, were brought together into one organization, the Agricultural Research Service.

Livestock regulatory programs were set up in three branches: Animal Disease Eradication, dealing with the eradication of brucellosis, tuberculosis, vesicular exanthema, and other special diseases, the inspection of public stockyards, and the enforcement of interstate regulations; Animal Inspection and Quarantine, the branch which is concerned with the movement of animals into and out of the United States, and licensing biological products; and the Meat Inspection Branch.

For many years, federal livestock regulatory workers have extended their coverage through cooperation with other agencies: With the states in animal disease eradication, with other federal departments in animal inspection and quarantine, and with the livestock, biological, and related industries.

The reorganization has facilitated this cooperation. It has given broader responsibilities to the federal veterinarian in the state. One man in each state represents USDA in the programs for the eradication of all animal diseases of major concern to livestock producers.

Cooperation has been strengthened in another way — by adding area regulatory officials. Experience has shown that with proper coordination, the practicing veterinarian can be used to good advantage in regulatory work. The new area workers have this supervisory responsibility.

11. Small Force Carrying a Heavy Load.

The job of protecting American livestock from disease and insuring a wholesome meat supply entails a continuing alertness on many fronts. In terms of the fight to be waged, the force is a small one — only 1,300 veterinarians and 2,500 laymen.

USDA does not have enough veterinarians and is having trouble replacing those who retire or resign. This is not a new development. There has been a steady decline for several years. For instance, in October 1950 there were 1,517 veterinarians in the regulatory service of BAI. By the end of 1951 only 1,451; the number was down to 1,340 at the beginning of fiscal 1955.

Recently, the U. S. Civil Service Commission approved a request by the Agricultural Research Service to pay higher salaries to veterinarians entering government work (VETERINARY MEDICINE, August 1955). Those with less than one year of experience may be appointed in the GS-7 classification with a salary of $4,930. and with a definite promise of a promotion to a GS-9 rating at $5,440 a year upon completion of six months' service and training.

A Look Into the Future

The prospect is that the market for livestock and livestock products will continue to expand. Agricultural economists estimate that by 1962 —if our population continues to increase at the present rate and the consumption of red meat remains the same—it will take 3,333,000 more cattle, 2,333,000 more sheep, and 9,000,000 more pigs to meet the requirements.

This represents an increase of 10% in livestock production in just seven years. It is equal to the present cattle population of North Dakota, New Mexico, and New Jersey; the present sheep population of Kansas, Nebraska, and Minnesota; the present swine population of Kansas, Nebraska, Missouri, South Dakota, and South Carolina.

The best opportunities appear to be through research leading to improved efficiency in livestock production, in raising acre yields of feed crops, in boosting pasture and range production, in breeding faster-gaining livestock, and in learning more about the nature of livestock diseases and finding more effective methods for their control.

The goal in tuberculosis eradication is elimination of the last infected animal. The present low incidence of bovine tuberculosis, in which the veterinarian has played a most prominent part, is considered to be the most outstanding achievement in the field of public health and economical livestock production during the last 50 years.

There are also opportunities in regulatory programs for bringing diseases, parasites, and insects under control. Today, these hazards are costing livestock and poultry producers about $2,700,000,000. a year. Conservative estimates from a recent nationwide survey by the Agricultural Research Service give losses in cattle from: Mastitis at $225,000,000. annually; leptospirosis, more than $110,000,000.; vibriosis, $137,000,000.; bloat, over $40,000,000,; and shipping fever, $25,000,000.

New diseases are continually coming to the fore. Recent examples are vesicular exanthema, scrapie, and bluetongue. Another, now up in front, is mucosal disease, or possibly diseases. These have shown up under various names in many parts of the country over the past ten years. The fact that symptoms are similar to those of rinderpest has caused regulatory officials considerable concern. However, Canadian tests appear to rule rinderpest out as a possibility.

We need to strengthen our system for detecting new diseases and alerting forces across the country to the threat they carry. One way this will likely be done in coming years is through a national reporting system for animal diseases.

One of the next big moves on the livestock disease front will probably be concerned with poultry. Present losses are staggering. Except for the highly successful efforts against pullorum disease, no full scale regulatory programs have been brought to bear on poultry diseases.

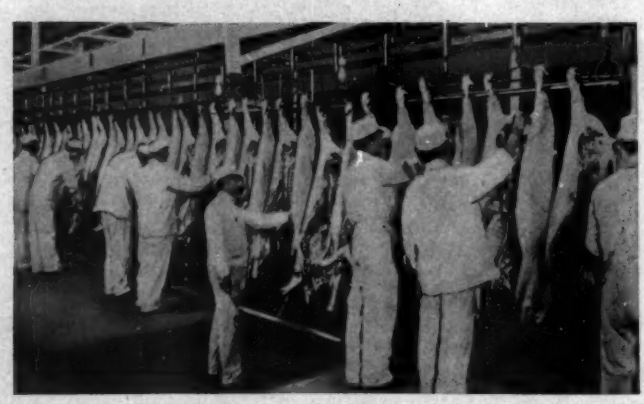
If the incidence of rabies continues to increase in food-producing animals, particularly cattle, regulatory programs probably will be set up to bring this disease under control.

New developments in biologics offer promise that we may be able to eradicate certain costly diseases in cattle and swine. New technics and materials are being perfected for the study of anaplasmosis and leptospirosis in cattle. These will make it possible for the first time to make extensive field tests and determine the occurrence of these diseases. With a modified hog cholera vaccine, now being perfected, we may be able to follow Canada's lead in eradicating this costly disease. Its spread has already been checked through the practice of cooking garbage thoroughly — the practice instituted during the campaign against vesicular exanthema.

Looking to the future, we see a continuing need for livestock regulatory activities. To serve successfully, they must be designed to keep pace with growing knowledge of animal parasites and diseases. They will offer the well-trained veterinarian broad opportunities in the field of public service. They will require of him wide knowledge and skill, not only in veterinary medicine but in public administration as well.

In the past, veterinarians who chose livestock regulatory work as a career have been trained for their duties through in-service programs after recruitment. Today, we know it would be highly advantageous if they could take college work definitely aimed toward livestock regulatory programs. In the future, we may expect the colleges to set up graduate courses that combine epidemiology and public administration that will be of great value to the young veterinarian going into public service.

One thing is certain. The job of keeping America's livestock healthy and assuring a wholesome meat supply is growing both in scope and complexity. It offers a great challenge that should attract able young people in the years ahead.



Final inspection and stamping in a modern slaughtering establishment.

Future Planning For Veterinary Public Health

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Veterinary medicine has a proud history in advancing the nation's health, although it has had to contend constantly for recognition.

The future of public health veterinary medicine is a challenge to the whole profession. Recently the World Health Organization reviewed what their contributions may be in future decades. Herewith is presented a summary of their deliberations which may serve as a blueprint for the future.

IN June 1955, public health and veterinary medical authorities met at the invitation of the Regional Office for Europe of the World Health Organization in Geneva, Switzerland, to discuss related human and animal health problems. The consultants[1] were asked to consider the effect of animal diseases on man's health, both through direct infection from disease animals or indirectly through eating infectious food of animal origin. Among the questions to be considered by the consultants were those inquiring about the extent of cooperation between veterinary, medical, and public health agencies and groups; the teaching of epizootiology in medical and hygiene courses; instruction of veterinary students in epidemiology and the effect of certain zoonoses on man's health; where should these courses be taught; how are veterinarians, physicians, and sanitarians to work together? One of the problems to overcome in answering these questions, was that of circumventing specialization, stressing the necessity of the team approach to common problems. This was summed up aptly by a participant, that teamwork should replace the old system of isolated responsibility, in order that specialist knowledge may be put to fullest use.

The Group, after much deliberation (the major problem was translating American English into British English) completed a report which attempted to define and answer some of these questions. Group members elected Professor A. Stampar, Director of the Zagreb, Yugoslavia, School of Public Health, chairman; Dr. I. Altara, Chief of Veterinary Services, High Commissariat of Health, Rome, Italy and member Executive Committee, *Office International des Epizootics*, Paris, vice chairman; and Dr. James H. Steele, Atlanta, Georgia, *rapporteur* (secretary-editor).

The report in its introduction reviews international activity in veterinary public health since 1950 when the Joint World Health Organization-Food Agriculture Organization Expert Group of Zoonoses[2] met under the leadership of Sir Daniel Cabot, Great Britain, and Professor J. Verge, France, to advise the member nations on animal disease problems that affect human health. The Seminar on Zoonoses[3] was the next meeting held. This convened in Vienna in November 1952 under the sponsorship of the European Office-Regional Office of the WHO, and FAO of the United Nations. Its purpose was to bring together medical, public health, and veterinary officials and investigators to discuss some of the diseases of public health and economic importance in Europe, *viz.*, bovine tuberculosis, brucellosis, leptospirosis, Q fever, and rabies. Other expert groups in which veterinarians have participated have held meetings on brucellosis,[4,5] rabies,[6,7,8] leptospirosis, meat hygiene,[9] food hygiene[10] and rural health[11]. One of the outstanding reports is that on The Zoonoses in Their Relation to Rural Health[12]. These advisory groups have assisted materially in helping to appraise both the incidence of certain disease problems and measures for their control. Future plans of the WHO in veterinary public health include expert committee meetings of leptospirosis, rabies, milk hygiene, and brucellosis and there are plans for a number of other specialized meetings and teaching seminars.

The major emphasis in food hygiene, a traditional veterinary activity, has been limited to milk and meat inspection, where WHO has worked closely with FAO. The proceedings of the WHO/FAO Meat Hygiene Seminar, held in Copenhagen in 1954 and the report of the WHO/FAO Committee on Meat Hygiene are now in press.

The Group adopted an agenda which covered a wide range of subjects. The agenda included:

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1. The definition of the field of veterinary public health and its function in the health services.

2. Methods for promoting advances in zoonoses, food hygiene, laboratory services, and related public health activities.

3. The reporting of animal morbidity and mortality, especially the zoonoses.

4. The present status of the zoonoses problems of Europe.

5. The establishment of effective liaison between health, agriculture, and conservation, as well as other agencies and groups.

6. The integration of the veterinary specialists (public health and research veterinarians) in the public health team.

7. The development of joint public health courses for medical, veterinary, and health scientists in areas of common interest.

8. Exploration of methods and means to bring about the cooperation and integration of those groups.

The following narration summarizes the consultants' views and opinions on the problems that were studied.

Definition of Veterinary Public Health. Veterinary public health is the field of activity which protects and advances human well-being by utilizing the combined knowledge and resources of all those concerned with human and animal health and their inter-relationships. Veterinary public health, according to the above definition, is concerned with the control and eradication of zoonoses; the development and supervision of food sanitation; laboratory and research aspects of diagnosis, biologics production, zootechniques, microbiology, epidemiology, comparative medicine and pathology; and the education and training of professional and auxiliary workers in veterinary phases of public health.

The purpose of establishing veterinary public health units in health administrations is to obtain the maximum contribution of veterinarians to protecting the public health. In many countries this will be a new concept in public health organization, and broaden the role of veterinary medicine without appreciably affecting veterinary administration in agricultural or other services concerned principally with livestock disease control. The report stresses that, "This distinction be kept clearly in mind, as the group does not recommend incorporation into health departments of veterinary services dealing with purely veterinary problems where these services have been long established and doing effective work in other governmental administrations."

Dr. James H. Steele

Zoonoses

The definition of zoonoses is as follows: "Zoonoses are those diseases which are transmitted naturally between vertebrate animals and man"[2]. There are more than 80 zoonoses but not all of these are of importance to European countries. This list is being revised in consultation with the WHO Expert Advisory Panel on Zoonoses, to include advances in knowledge since the list was prepared in December 1950. A few of the more important are considered in this report.

The epidemiology and control of zoonoses are a major concern of public health authorities inasmuch as these diseases constitute an important cause of ill health and poverty brought about by the acute or chronic infections they cause in man, and to the large economic losses to agriculture and trade. In addition to the immediate diseases and problems caused by certain animal diseases, there should not be overlooked the dynamic and changing pattern of microorganisms, their adaptation to new animal hosts and their potential and actual transfer to human beings. The uncovering of unsuspected human-animal relationship of communicable diseases therefore are to be expected. Examples of the latter during the past few years are bird reservoirs of the virus encephalitides, the recognition of leptospirosis

among farm animals, the appearance of bat rabies in the eastern hemisphere and the wide spread mammalian reservoirs of the psittacosis-lymphogranuloma venereum group of viruses. The Group urged that vigorous action be taken to reduce, and if possible, to eradicate the major zoonoses and maintain an epidemic intelligence service for the surveillance of less important zoonoses and vigilance for the appearance of new animal-borne diseases.

The prevention and elimination of zoonoses in man depend, in large measure, on the control in animals, including birds. Experience has shown that these diseases, by their very nature, cannot always be combatted adequately by the separate endeavors of health and agriculture authorities (*e.g.* hydatid disease, bovine tuberculosis, and brucellosis). The best approach to achieve an effective attack on a zoonosis is by coordinating the efforts of public health, agricultural, and other groups. Veterinary public health units in government services are the logical agencies to bring these groups together and are particularly useful in campaigns directed against animal diseases that threaten man's health as well as his welfare.

Major Zoonosis Problems of Europe

Many of these problems have been the subject of special WHO/FAO reports, which treat control methods[2,3,4,5,6,7,8]. In the present report only four are considered, *viz.* bovine tuberculosis, brucellosis, rabies, and hydatidosis. These four diseases are of considerable importance in various areas of Europe and the Group feels that methods of control and even eradication are sufficiently advanced and understood to enable countries to inaugurate schemes where they are not already in operation. In combatting these diseases success will depend in varying degrees on the successful collaboration and cooperation, and in this respect veterinary public health within the health services will be able to assist greatly.

Bovine Tuberculosis

In some parts of Europe, bovine tuberculosis is still a serious menace to man and animal populations. Following the adoption of well-planned control campaigns, the disease has been completely or nearly eradicated from the cattle of some European countries (eradicated in Norway and Finland (nearly so in Sweden and Denmark, greatly reduced in Holland and Great Britain, organized programs reducing disease in Germany and France) while in others plans are being made toward this end. It has been shown clearly that the most effective methods of control and eradication of the disease is the detection of infected cattle, by means of the tuberculin test and their removal from contact with healthy animals. In order that tuberculin testing can be effective, it is essential that tuberculin of adequate potency be used and that standard interpretation of results be made.

The Group went on to say that they are of the opinion that vaccination (BCG, vole acid-fast bacilli) as a method of control of bovine tuberculosis should not be permitted except under special conditions where no other system is possible and then only as a purely temporary measure. (BCG is used in Italy; its use has been discouraged in France where formerly it was used widely). The application of the vaccines at present available cause a sensitivity to tuberculin and hence their use is not compatible with an eradication plan which depends upon tuberculin testing.

It should be stressed therefore that the use of vaccines and therapeutic agents must be excluded from any official systematic campaign for the control and eradication of bovine tuberculosis.

The Group also called attention to open and closed tuberculosis in cattle and emphasized that no distinction should be made between these cases in the control program.

In order to control, and eventually eradicate, bovine tuberculosis it is necessary to enlist the cooperation of all interested in health and agriculture pursuits. An incentive must be given to dairy farm operators and livestock owners. This should be done through the provision of special funds by governments, agricultural organizations, and other possible sources. Educational campaigns are important in promoting bovine tuberculosis campaigns, both among farmers to eradicate the problem in their herds, and in creating a public demand for milk and milk products, and meat from animals free from tuberculosis. Although pasteurization usually kills viable tuberculosis organisms in milk, the method has certain limitations as practiced in areas where there is heavy infection among animals.

The following steps were recommended by the Group to governmental authorities and persons interested in the eradication of bovine tuberculosis:

1. Adequate funds should be provided to cover the costs of the program including payment of indemnities, technical services, and administrative expenses. Funds should be ob-

tained not only from agricultural and health ministries and departments but also from cooperating rural, livestock, and dairy associations.

2. Milk from disease-free herds should receive a premium price, while milk from diseased herds should receive a lower price.

3. Routine exchange of animal and human tuberculosis reports between medical, veterinary, and livestock authorities. This will aid in identifying sources of disease both in man and animals so prompt action can be taken to eliminate these foci of infection from further spreading disease.

4. Encourage the use of common laboratory facilities for diagnosis, research and the preparation of biological products used in the control of tuberculosis.

5. Education of the public on how bovine tuberculosis is transmitted to man and among animals and the economic advantages that will result from its eradication. The full support of the public, both urban and rural is essential to the success of any control program.

6. The organization of national advisory councils to promote, guide and assist in the overall program. Membership should include representatives of government, medical and veterinary, and other public health workers, farmers and consumers.

Brucellosis

Brucella abortus infection is still prevalent in most European countries. In some other countries rapid progress is being made toward eradication, or already has been achieved (Norway, Sweden, and Finland are practically free of the disease). The practice of adequate testing, good environmental sanitation practices, together with the use of proven vaccines (strain 19) is leading to control and eradication.

The Group realized that the control of *Br. abortus* infection in cattle is difficult where bovine tuberculosis control is given precedence. Nevertheless, combined efforts of those concerned can make appreciable advances toward the ultimate goal.

The same general recommendations as made for bovine tuberculosis, as summarized previously, apply to brucellosis eradication.

Br. melitensis and *Br. suis* infections appear to be increasing in prevalence and spreading to hitherto noninfected areas according to the information presented to the Group by various experts. These diseases in man and animals should be made notifiable. Because of the seriousness of these infections in man and the depressing effect on the agricultural economy, their control and eradication are urgent. Brucellosis of sheep, goats, and swine lends itself to rapid eradication if drastic means are adopted. The slaughter of the entire flock or herd in which infection is diagnosed (sheep, goats, and swine) will insure that not only will the infected animals be eliminated, but also the hazard of carriers and contamination of the immediate surroundings. The importance of epizootiological investigation was revealed by recent findings of *Brucella suis* in hares in Denmark.

Rabies

Although many European countries have been free from rabies for years and are still free (Great Britain, Norway, Sweden, Denmark, Holland, Belgium, and France) the disease is prevalent in southern and eastern Europe, and threatens countries at present free of infection. The most serious threat is the prevalence of the disease in wild animals. This menace has caused some countries to inaugurate control measures, including canine vaccination, dog restriction, and wildlife reduction in frontier areas. The finding of rabies virus in a bat in Germany is of importance in evaluating the problem.

The WHO Expert Committee on Rabies has made two reports and the Group endorsed their recommendations[6,7]. It has been shown clearly that rabies can be well controlled and finally eradicated from countries or areas by the application of these recommendations. Implementation of these recommendations should be extended to all countries and areas where the problem persists. The Group briefed the salient points of control and they are as follows:

1. Close liaison between health and veterinary services to improve reporting, diagnostic procedures, production and potency testing of biological poducts.

2. Control campaigns should be centralized under a single authority headed by a veterinarian.

3. Agreements for prompt and periodic exchange of information should be arranged, and collaborative programs instituted in border areas.

4. Preparation and distribution of information on rabies to medical and veterinary physicians so that rabies will be readily recognized and dealt with.

5. All means of publicity should be used

to inform the public about the important aspects of the disease in order to obtain their cooperation to insure support of control measures.

Hydatidosis

Hydatidosis is the cause of considerable suffering in man and large economic loss in southern and eastern Europe, particularly in the Mediterranean countries. Its presence in other parts of Europe, although less extensive, must also be considered. By the adoption of vigorous measures, it has been shown that the disease can be eradicated from an entire country (Iceland). Strict control of abattoir sanitation is essential so as to prevent the spread of infection among dogs by the ingestion of infected offal. In the transmission cycle, sheep and goats probably play a more important part than do other kinds of livestock. Wild animals also can serve as reservoirs of the disease.

The treatment of infected dogs forms an important part of any campaign for the control and eradication of hydatidosis. The elimination of the mature parasite, *Echinococcus granulosus*, from the intestinal tract of infected dogs may be effected by the proper administration of anthelmintics of proved potency. Arecoline hydrobromide has been found to be the most satisfactory. Regular treatment of dogs is necessary, and often can be combined with antirabies immunization programs. It is essential to watch for the expelled tapeworm and destroy it, either by burning or burial. The hair coat of the dog must be disinfected to destroy adhering eggs. These latter precautions are important in preventing the introduction of *E. granulosus* eggs into households or contaminating hands of man or his food. Some epidemiologists believe that the tapeworm eggs may be airborne and carried into human habitations.

Concerted collaborative effort between health and agriculture authorities is a prerequisite to any control effort, and to this end the Group recommends these measures. They are summarized as follows:

1. Delegation of administrative responsibility for coordinating control program and maintaining liaison to the field.

2. Public education. This is essential in rural schools.

3. The promotion of sanitary abattoir facilities and utilization of offal so as not to spread disease.

4. The organization of dog treatment programs, combined with antirabies vaccination where indicated, and dog reduction. The antihelminthic treatment (preferably every three months) should cover at least one year. As far as possible such programs should be organized without cost to the rural population, and provision should be made to continue the campaign with local resources for a period of years.

Food Hygiene

The Group limited its consideration to certain administrative problems which are encountered in the execution of food hygiene responsibilities, inasmuch as considerable attention had already been given to the technical problems by expert groups previously convened. The essence of the discussions follows:

In government, responsibility for food hygiene control varies between countries, and within countries at national, provincial, city, and rural administrations. Thus, departments of agriculture, food, health, interior, sanitation and welfare are found to be solely or partially responsible for food hygiene, inspection and sanitation. While historical and political factors have often determined the administrative site of food hygiene responsibility, very frequently chance, inertia, frictions, or other extraneous reasons have influenced the organizations to their detriment.

It should be emphasized that the primary purpose of food hygiene is to prevent transmission of disease to man through food products, and to insure that the consumer receives a wholesome, nutritious, and acceptable product; thus supervision of food hygience is essentially a public health function. It is well known that, in addition, food hygiene decreases food losses, contributes to livestock disease control administration, and encourages good animal husbandry and farming practices.

It is clear that efficient discharge of food hygiene obligations requires the closest cooperation between health and agriculture authorities. The triad of veterinarian, medical officer, and engineer provide the foundation of professional service upon which a food hygiene program is built. It is equally clear that the veterinarian, because of his training, is preeminently qualified to supervise the major aspects of food hygiene.

The Group therefore recommends that, wherever possible, food hygiene programs should be placed under one administrative unit. An appropriate unit would be a veterinary public health service. The Group

realizes that in countries where there has been a long established division of responsibility, the unification suggested would not be easily accomplished. However, the desirability of such a step should be recognized and made wherever feasible.

Laboratory Services

Veterinary and human medicine are branches of greater medicine. Common denominators of medicine include histology, bacteriology, parasitology, pathology, immunology, and pharmacology, which together with indirectly related courses in medicine, surgery, therapeutics, comprise the curriculum of veterinary and medical schools. Included in this activity are similar laboratory disciplines and therefore collaboration is to be encouraged.

Health laboratories at all levels of government can use veterinarians as staff members in many activities and areas, especially the diagnosis of the zoonoses, in which he is particularly well qualified. The performance and interpretation of diagnositic tests, the development of new procedures and their evaluation, the production of biological products are all areas in which the veterinarian is well qualified. In research activities he can contribute in planning and execution, and is generally a valued collaborator. The veterinarian in the health laboratory is often the liaison to the agriculture laboratories. In view of the fact that research findings continue to reveal conditions in animals which are of direct concern to health authorities, it is of the utmost importance that maximum cooperation exist between health and veterinary research laboratories.

Experimental Medicine

The Group emphasized the interprofessional approach in this field as essential. Considerable progress has been made with advances in therapeutics, surgery, bacteriology, mycology, and physiology attesting to that. New knowledge of nuclear energy, and its usefulness in diagnosis and therapeusis, requires concentrated effort and study, and emphasizes further the team approach to medical research. The value of veterinary knowledge and assistance in this new field is evident.

Zootechnics

The care and production of laboratory animals is of great importance to the execution of research. The availability of disease free laboratory animals is essential to any research program. Veterinarians engaged in their production should intensify their efforts for improving production and meeting the laboratory needs. The administration of such programs should be in the hands of qualified veterinarians who have had experience in laboratory administration, animal husbandry, nutrition, and disease control.

ORGANIZATION OF VETERINARY PUBLIC HEALTH

Veterinary Public Health Units

The rapid advances in public health in hitherto lesser developed regions and the increased demands and needs for improved public health practices in both these and the more advanced regions, have required reorganization in public health administration. One of the resultant developments has been the recognition given to veterinary public health. Many national, state, and urban health departments employ veterinarians to perform one or more of the functions included under veterinary public health.

Traditional public health practices have served to individualize the work of public health veterinarians, and to separate them in various administrative units. This would appear to be justified in some instances where the work in question is an integral part of a functional unit. In other countries, particularly in the Americas and some European countries, veterinary public health has been recognized in varying degrees and established in the health services as a functional unit.

No single pattern for veterinary public health practices at all levels of government can be given because of the varied conditions encountered in different countries. In general, it would appear logical first to establish veterinary public health units in national and state health departments, and later in rural and urban as soon as this is economically feasible, and when trained personnel are available. Veterinary public health at these various government levels were then studied by the Group with the following recommendations:

National. Veterinary public health units in national health agencies are usually part of the preventive medical services although some special activities will require public health veterinarians in other programs, *e. g.*, research, diagnostic, and special services. The director of the veterinary public health unit is responsible for coordinating the veterinary public health operations and integrating the activities

into the public health services. The director also is advisor to the national health administration on all problems that involve animal diseases and human health. In most national health administrations the principal areas of veterinary public health operation are epidemiology of the zoonoses and their control, food hygiene, and research. In addition, the veterinary service is responsible for developing standards for certain biological products, diagnostic procedures and tests. The importance of maintaining liaison with agriculture and other interested agencies and associations is basic to the development of veterinary public health services.

Research activities encompass a broad area in preventive medicine including microbiology, experimental epidemiology, comparative pathology, food quality control, and utilization of nuclear energy. Most of these investigations are performed as a part of a research team. New knowledge that has wide application and use has already been developed in the epidemiology of the virus encephalitides, Q fever, hydatid disease, psittacosis group infections, and in their diagnosis and control methods.

Zoonoses control is the most important aspect of a veterinary public health program. Control activities in the national service consist largely of consultation and technical guidance, and the assignment of specialists to the areas where the problems have arisen. Sometimes the national agency may assign public health veterinarians to organize emergency control programs or to assist in the development of long range operations for the control and eventual eradication of zoonoses of public health importance.

State or Provincial. The development of state or provincial veterinary public health functions is determined by health problems in the area. State and national programs are similar because both include zoonoses control, food hygiene, and research projects. The state public health veterinarian, like his counterpart at the national level, is responsible for coordinating the veterinary public health services and advising the state health officer on animal disease problems that affect man. The state public health veterinarian's principal function will be to coordinate local and national efforts to provide information to the local units from the national level, and vice versa, to work with public health officials on problems that arise, and to consult with local units and provide technical guidance and advice. At times it will be necessary to participate in the organization of disease control operations in local units, especially where professional staffs are not available locally.

One of the more important functions is the stimulating of interest in all public health programs and animal disease reporting among veterinarians. Experience has proved that veterinary practitioners will support public health measures and supply important data on animal disease incidence when they are provided with information on the prevalence of animal and human diseases in a state along with specific information on control procedures. The practicing veterinarian is an influential leader in preventive medicine in his community and often can direct public opinion to adopt a program or regulations that will control or eliminate disease. He also has considerable influence among his clients in the removal of diseased animals, *e. g.*, tuberculosis and brucellosis reactors, or in accepting prophylactic measures, *e. g.*, rabies vaccination, cooking of garbage or offal, and stable hygiene. The veterinarian also is an important link in public health education. He advises the farmer on the hazard of certain animal diseases to his health and that of his family.

Urban Health Departments. The local health department often has a veterinarian who is charged with supervision of food hygiene. The activities usually include meat and poultry inspection, milk sanitation, food handling, and coordination of inspection with other health jurisdictions.

The services of the veterinarian in local units can be expanded through public health training. His services can be utilized in a broader area, especially in preventive medicine. The well trained public health veterinarian, because of his basic education in biology, and professional training in comparative and veterinary medicine and public health, is often the best equipped professional individual to serve as an assistant or deputy health officer. In many areas, where the shortage of physicians and medical officers is acute, the public health veterinarian has been appointed health officer.

The local unit is where technical operations and principles, discovered or formulated at the state and national levels, are executed. Thus we find that zoonoses control and food hygiene regulations are put into effect by the local public health veterinarian. It has already been pointed out that he had the responsibility for food hygiene, and often animal disease control is coordinated with milk and meat inspection, *e. g.* tuberculosis, brucellosis, and mastitis testing should be required of all milk

under the supervision of the health department. Naturally such a requirement should allow a reasonable length of time for the dairy farmer to comply so as not to work undue hardship on the milk producing farmer.

The local public health veterinarian also has the responsibility of reporting disease outbreaks to the state and national authorities and of maintaining liaison with groups interested in animal disease problems and public health. The importance of cooperation with veterinary practitioners is worth stressing again. As in state operations, it is essential that veterinarians be kept informed on public health objectives and activities, and that they receive regular reports on the prevalence of animal diseases in their area.

Rural Health Departments. Of all population groups, rural people are most frequently exposed and affected by animal diseases. The situation often requires the assignment of a full time public health veterinarian but unfortunately it is not always possible. Under these conditions, local veterinarians can serve on a part time basis as important components in health programs. This fact was recognized by the WHO Expert committee on Public Health Administration who, in their second report[11] on planning an integrated health program for rural areas, stated:

"One of the important responsibilities of local health officers in the control of communicable diseases, particularly in rural areas, concerns the zoonoses . . . The adequate control of these diseases requires cooperative effort on the part of health and agricultural officials, and the local health officer can obtain invaluable aid in meeting zoonoses problems by establishing close working relationships with veterinarians and their assistants. The veterinarian also can be assigned responsibility for the control of food hygiene, particularly with respect to meat and milk, and thereby relieve the local health officer of tasks which are either unnecessarily time-consuming or else neglected altogether. Apart from the scientific training of the veterinarian and his concern with diseases common to man and animals, his direct contacts and importance in rural community life make him a useful member of the local team."

Where there is a shortage of veterinarians, it is often possible to get the cooperation of agriculture advisors, stock inspectors, and vaccinators in reporting disease outbreaks. Veterinarians or their representatives can contribute greatly toward improving the health and economic status of the local inhabitants. This can be done by the veterinarian or his deputy by assuming the role of an educator and advisor on animal husbandry, disease control, and hygiene, which will result in economic benefits. With a sound agriculture economy it is much easier for the health team to provide basic sanitary improvements (*e. g.* insect control, waste disposal, water protection, food hygiene), and preventive medical practices (immunizations, obstetrical care, nutrition, tuberculosis examination). Any rural public health team should include public health veterinarians or technicians to assume the responsibility of food hygiene, animal disease control, and reporting. The education of children is an important means of disseminating animal disease control knowledge. The enlistment of their cooperation has proven invaluable in the control of certain zoonoses, *e. g.* brucellosis, tuberculosis, hydatid disease and rabies.

Morbidity and Mortality Reporting. Animal disease reporting is inadequate in many countries. The first principle of disease control is to establish practical methods for ascertaining their incidence and progress. Organized reporting of animal morbidity and mortality is essential to the development of veterinary public health operations, and should be undertaken as soon as possible. The organization of a reporting system requires cooperation between all interested agencies and groups.

The first step in organizing an animal disease reporting program is to secure the assistance of statistical experts to advise and guide in the technical aspects of collecting and analyzing data. Statisticians and veterinarians who have had experience in establishing reporting systems recommend that a code number be used for each disease, so that data can be transcribed readily to cards that can be machine tabulated and sorted. Such procedures are efficient and permit reports to be compiled and distributed within days. The list of diseases on which information is requested is agreed on by the various collaborating agencies and associations.

Cooperation of veterinary practitioners is foremost in the success of a reporting system. This cooperation usually can be achieved by keeping the veterinarian informed regularly of animal disease prevalence as well as certain human diseases. These notices are augmented in value by including brief summaries of current interest.

Veterinary Public Health Education. The Group reviewed the problems of health workers' education and especially that of public

health veterinarians. The consensus of the Group was that the aim of veterinary public health education is to make available the knowledge necessary to enable veterinarians to contribute to the fulfillment of the objectives of public health services. The requirements of the veterinary medical professional in protecting the public health can be met only if the veterinarian has been trained suitably for work in this area. In his education he should be made familiar with the philosophy of public health and preventive medicine. Early in his training he should be imbued with the opportunities in public service. Occasions should be afforded him to bcome acquainted with the role of the veterinarian in the promotion and development of community, state and national health programs. A well informed veterinary profession is an essential keystone to a well balanced, effective health program. The responsibility of this training lies primarily with veterinary medical colleges, although every opportunity to enlighten the veterinary medical profession should be exploited.

Early in its development, veterinary practice had to take cognizance of the need to bring under control epizootics, which emphasized the importance of herd or community health in distinction to individual health. Methods of eradication eventually led to the study of methods of prevention, which influenced teaching practices. Instruction in preventive medicine, animal nutrition, farm herd hygiene, and environmental hygiene took an important place in veterinary education. Economic conditions governing livestock production have influenced the veterinary medical schools to devote much more attention to those environmental factors influencing the optimum development of animals and their products. This training for the veterinarian is in keeping with the modern public health approach of considering all factors governing community health in addition to the needs of the individual. The veterinarian fits with special facility into the family of public health since he has been accustomed to the concept of protection of populations against crowds, diseases and malnutrition, as well as the study of the individual.

The subjects mentioned above, together with food hygiene, have been part of the veterinary medical curriculums of different countries under such headings as veterinary preventive medicine, veterinary hygiene, dietetics and animal husbandry, animal sanitation, veterinary state medicine, or veterinary public health. The Group recommended that the term "veterinary public health" should be used more generally in veterinary education to cover the subjects related to public health.

The Group reiterated the desirability of liaison between the medical and veterinary professions, and pointed out that such relationship should begin in the professional school and carry foward into postgraduate training. Thus the veterinarian could share, to advantage, his postgraduate training with physicians in such fields as epidemiology, biostatistics, public health administration, sanitation, and infectious disease control. Such development, including the same or equivalent degree (in the United States the same degree, the master of public health, is awarded to physicians and veterinarians) would be to the mutual advantage of the future medical and veterinary public health worker. Postgraduate training of the character proposed would strengthen the veterinarian's position and enable him to fill more efficiently supervisory and administrative posts.

The training for public health veterinarians recommended by the Group should include advanced instruction in specialized fields which are of particular importance to veterinary public health, *viz.*, epidemiology, bacteriology, immunology, virology, parasitology, medical entomology, communicable diseases of animals and man, tropical medicine, environmental sanitation, animal and human nutrition, and food hygiene. Other courses should include public health administration, public health aspects of education, law, economics, biostatistics, occupational health (especially rural problems), and functions of auxiliary personnel in public health. This instruction will enable the veterinarian to understand his position and contribute more fully to the development of a more effective health program.

The Group gave attention to the problem of training veterinary auxiliary personnel, which is especially important in the lesser developed areas of the world. The use of technical assistants in other areas of public health was pointed out as necessary to allow the best utilization of professional persons' time and service, *viz.*, nurse, dental hygienists, sanitarians.

The successful use of trained adjunctive personnel by the veterinary profession is not new. To accomplish their mission with a minimum of veterinarians, but with a high degree of efficiency, the veterinary military services in many countries have inaugurated technical and field training courses for selected, enlisted personnel. After the successful completion of the required courses, these enlisted personnel

work under the supervision of veterinary officers. They execute routine tasks, receiving only such professional supervision as circumstances may require. This procedure has also proved effective in civil food inspection services and assures optimal use of professional personnel.

In areas where there is a need for veterinary auxiliary technicians, competent men of high integrity must be selected. Therefore, their training, licensing, and relation to the veterinary profession, should be under the guidance and control of veterinary medical school and licensing authorities.

The Group, in concluding their report on education, urged that refresher courses and in-service training be organized by national and state health services so as to enable public health veterinarians to keep abreast of new knowledge and developments. It is expected that although such courses will vary both in length and in scope, each will provide certain necessary technical information to meet program needs. Experience indicates that best results are achieved through courses which are informative and stimulating, yet short.

Comment

The development of public health veterinary medicine in recent years in the United States offers opportunities unheard of only a few years ago. It is less than 20 years ago that a former president of the American Veterinary Medical Association inquired of a leading public health official what opportunities existed for young veterinarians in the public health field. He was informed that there was little opportunity for veterinarians in public health. Even during World War II, many public health authorities saw few places for veterinarians in organized health work. It was only with the inauguration of veterinary public health activities in the U. S. Public Health Service in 1945, that interest began to manifest itself in state and local health agencies. Ten years ago, only two or three states had a veterinarian in their health department, and then usually in some special position where he had little opportunity to contribute to the overall health program. In the past decade more than 30 states have inaugurated veterinary public health activities. In many of these states the public health veterinarian has grown in status and has been delegated more administrative responsibilities. A number of state health departments have been named the public health veterinarian either Assistant Chief or Acting Chief of Communicable Disease Control (also called State Epidemiologist). Some states have also utilized their public health veterinarians in many other capacities including legislative liaison, special assistants, secretaries, and chairmen of special commissions or groups. This professional recognition has not only occurred in state health agencies but similar developments have taken place in city and local health departments. The acceptance of veterinary medical skills in the international health field is one of the outstanding achievements in the mid-twentieth century. The World Health Organization and the Pan-American Sanitary Bureau have found their veterinary public health programs one of their many outstanding achievements in the past decade. The preparation of the numerous special reports by the World Health Organization on veterinary public health problems, in addition to the many scientific contributions by national, state, and local veterinary public health investigators and university researchers to the advancement of human health and welfare speaks well for the future of veterinary medicine's contribution to the public health sciences.

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Changing Concepts Of Military Veterinary Medicine†

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MILITARY veterinary medicine is experiencing a drastic evolutionary change. Its concept has become broader and more meaningful. Some of these changes and the philosophies which have already exerted, and that will continue to exert, influence upon the profession and its capabilities may be reviewed to make realistic the place of the veterinarian in the military establishment. This can be done best by answering four pertinent questions. First: Why are we interested in military service? Second: What is the role of veterinary medicine in the military service? Third: How was our present position in the military attained? Fourth: What is the significance of military veterinary medicine outside the military; *i.e.*, to you, your profession, the country, and the national health?

Why Are We Interested in the Military?

There are several reasons for professional interest in military medicine. First perhaps is a personal one. The veterinarian, like any other citizen, has a patriotic desire and obligation to serve his country when needed. To each of us there comes a time when it is necessary to serve.

Perhaps we are interested as businessmen and taxpayers. If we are not, we should be because the Armed Forces spend millions of dollars of our tax money every day.

Surely we are interested in it as a means of survival in this strange, new world. It has been rightly said that the Air Force is the most important American institution today. Medical service, and that includes veterinary service, is an essential part of it.

Probably the thing that stimulates our interest most is pride in profession and full awareness that we, collectively, can render a valuable service.

Brig. Gen. Wayne O. Kester, U.S.A.F. (VC)

We have always known this—known it better than the military. Oddly, we have had to fight for the privilege of rendering that service. Witness the long struggle of the old stalwarts in the A.V.M.A. for the establishment of an Army Veterinary Corps and the continuing battle to improve, even maintain military veterinary service. Unless you have served in Washington, you can not be aware of the continuing pressure for explaining, defending, and preserving a professional Veterinary Corps in the armed services.

Strange, but true; and as it should be. It must be kept in mind that there is always a limited number of dollars and a limited number of people available for national defense. Those dollars and those people must be used in the manner that will provide the most protection for the least cost. This results in severe but healthy competition within the several components of the military services and also the ruthless elimination of nonessential and less important activities. There is no room in the military for any science or service that does not contribute materially to the success of the military mission.

†Presented at the 17th Annual Conference for Kansas Veterinarians at the School of Veterinary Medicine, Kansas State College, Manhattan, June 2-4, 1955.

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The profession must do a job for the military that the military needs done. Not only that, we must prove that the job needs to be done and that we can best do it.

There is nothing unusual about this situation. All veterinary practitioners are in a similar position. They, too, must provide the type of service their communities need and must do it better than anyone else or they will be out of business.

Veterinary leaders have always been aware of this competitive atmosphere. They have fought to hold and advance the position of our profession in the armed services. They have had wholehearted support, and they have been most successful. Evident is the fact that only five professions are given corps status in the Air Force. Veterinary medicine is one of them.

A recent milestone was the prompt action the A.V.M.A. took in 1950 to have veterinarians included in the Doctor-Draft Law. Had veterinarians not been drafted along with physicians and dentists, it is most probable that there would be no Army or Air Force Veterinary Corps today. Instead, there would have been only a few veterinary officers available for the tremendous veterinary job. If veterinarians had not been available, a way would have been found to get along without them. The military must and does get its job done no matter how little it has to work with. Consequently, less skilled and less efficient people would have been used, resulting in an inferior manner of performance and the loss of prestige and standing for the profession.

Barring unforeseen emergencies, there is no longer need of a special draft for veterinarians. Young graduates subject to the basic draft law will more than fill future requirements. The present Doctor-Draft Law is now history. It brought real hardship to many but at the same time it served our country well, it assured the future of the veterinary profession in the military services, and it placed us firmly alongside the medical and dental professions as to essentiality in the eyes of the public. We owe a debt of gratitude to every man who has stepped up and served since the outbreak of the Korean conflict.

The Role of the Veterinary Officer

During World War I we regarded the veterinary officer either as a meat inspector or a specialist in equine medicine and surgery. We were prone to view him in the same light during World War II. This concept changed rapidly because there were few horses to treat and the meat inspection problem was well in hand. War and military necessity demanded veterinary know-how and assistance in many other areas.

The veterinary officer rapidly became an inspector of all types of food. His activity was no longer restricted to meat inspection. Further, he became more than an inspector. Today he is regarded as a consultant and technical advisor on all food problems in the service.

He became concerned with more than just foods. It was readily apparent that he had a unique ability to assist medical officers in their preventive medicine problems. He was especially helpful in the field of environmental sanitation. This included the sanitary and medical aspects of such things as housing, eating establishments, recreation facilities, insect and rodent control, waste products disposal, and other factors affecting the general sanitation of the military community.

He became the surgeon's right-hand man in the ageless military problem of preventing and controlling food- and water-borne diseases.

His role as a consultant and advisor on the zoonoses is of even greater significance—implementing and supervising animal disease control programs, quarantines, and other measures necessary to protect human health from zoonotic diseases in the military community. In short, he became a public health veterinarian in the broadest definition of the term. As a direct result of this experience added impetus was given to the stabilization of the position of the public health veterinarian in this relatively new branch of veterinary medicine.

Research is another field in which he has forged ahead. It became more apparent that he had much to offer in research support—not just in producing and managing research animals, but as a member of medical and other research teams working on problems in surgery, physiology, human stress, deceleration, shock, burns, pathology, virology, space medicine, radiobiology, epidemiology, and many others related to military and aviation medicine.

He plays a significant role in the field of food technology. His work here is not so much in pure research as it is in the practical application of what is already known about foods and nutrition to the development of military rations and better troop feeding.

Monkey being readied for history making high altitude flight of 36 miles in an Aerobee at Holloman Air Force Base in 1951. This "high flying" primate now resides in the Washington zoo. Veterinarians actively participate in numerous Air Force research teams. Health and management of all laboratory animals is a veterinary research support activity.

He is not in research for the sake of doing pure veterinary research. His major role is to add what he can by integrating veterinary know-how into medical and all other research problems.

How Was Our Position Attained?

First we recognized the obvious fact that we must do a job that needed to be done. Further, we as an organized profession through our Veterinary Corps must be able to do that job better than anyone else in the military. Finally the job must be a professional one which allows the application of much of the broad knowledge gained in scientific study. Specifically, any job we as a corps undertake must be grounded firmly upon or related to some facet of veterinary teaching and knowledge.

Faced with these facts we set out many years ago to find and do that job. The search is never ending. Each advance or change in weapons systems or military organization adds to or alters our job. We must foresee and be ready for those changes or we fail both ourselves and our country.

From your knowledge of history you know that the nature and status of military veterinary service has changed markedly over the years. However, the change and progress in this instance has been no more rapid or greater than in veterinary medicine in general or in military science and tactics. There has been in fact an exact parallel.

One might assume that these progressive changes were brought about by topside edict —a flattering thought for those of us who have served in the Pentagon, but not true. All real progress stems from a gradual and determined grass roots evolution—each veterinary officer at his station the world over is looking for and doing a little bigger job and a little better job of utilizing his professional knowledge each day, just as does the successful civilian practitioner.

During and since the Korean mobilization, a great many veterinarians found themselves suddenly in the military service confronted with community public health and preventive medicine problems new to them. Even though they had little, if any, special training for their new jobs, they readily obtained a grasp of military problems and requirements and quickly directed their energy and professional knowledge along the lines just mentioned. Their performance speaks well indeed for the training and quality of the students being graduated from veterinary colleges today.

This is not surprising if we evaluate realistically the needs and resources of the military and at the same time correctly appraise what is being taught in our veterinary colleges. Today's graduate possesses a wealth of information. He has a broad professional base. He is ready to specialize in any of several areas, military veterinary medicine being one of them. He is a far more versatile individual than even he suspects. If he lacks knowledge to do the job at hand, he acquires it, and if he lacks proficiency, he develops it, be his forte in practice, research, teaching, military service, or other specialty. That there is and will continue to be a big job in the military for him to do is unquestioned and that he is doing it is self-evident.

The Significance of Military Veterinary Medicine

We could discuss at length the accomplishments of Kelser, Kintner, Randall, and many others who made laboratory studies and research their service career—their work on rabies, rinderpest, equine encephalomyelitis, Japanese B encephalitis, anthrax, leptospirosis,

influenza, and many other diseases, also their work in the development of new laboratory technics, tissue culture, chick embryo virus culture, and improved vaccines. But you all know of these men, their accomplishments, and their obvious impact on veterinary research and development in general. They paved the way for veterinary participation in military research. By so doing they not only enhanced their own professional stature but yours and mine, as well as that of veterinary medicine in general.

The same can be said of many more. Among them is that small but growing number of veterinary officers working in radiobiology. This is a young group in a new field into which only a few outside the service have delved. We will hear more of them, but already they are regarded as world authorities on some of the perplexing medical problems associated with radiation ionization and the use of atomic energy.

We have many others in the research field tying medicine, veterinary medicine, and allied sciences together for the advancement of all and the betterment of mankind.

This is true also of a large number that have specialized in veterinary public health. Veterinary officers in recent years have been enrolled in practically all of the country's graduate schools of public health. They have been excellent students—fine representatives of the profession. They disseminated a wealth of information at these schools and left a new and broader concept of veterinary medicine with a host of students and faculty members. This concept has permeated the whole public health field. It has engendered the balanced public health team approach to health problems and the inclusion of veterinarians in all such teams both in the service and out.

That a military community to survive must have a comprehensive preventive medicine program is unquestioned, and that any total health program must include veterinary medicine is now an established and accepted fact in the military—a point of view becoming generally accepted in civilian communities.

Although seldom noted in the public eye, our military veterinary food inspection system has made some tremendous contributions to the public's welfare. Standards of sanitation in food industries have been elevated not only in this country but in foreign lands. New methods of sanitizing have been introduced. Quality control in manufacturing processes has become routine in many food industries, resulting in more palatable, safer, and saleable foods. Seafood industries, especially the shrimp industry, is illustrative of many that have progressed and benefited from inspection. The swing of the poultry industry from producing New York dressed to the modern eviscerated ready-to-cook poultry now available at any public market, the development of frozen milk, improved methods of reconstituting whole milk and other dairy products, improved practices in packaging, storing, and warehousing throughout the food industries, safe lunches for airline passengers, and many other advances stem from our food inspection service.

Public relations for veterinary medicine is the most important single by-product of military veterinary service. Every veterinarian who wears the uniform makes his contribution, good or otherwise.

It is an interesting fact that several hundred thousand people, including military dependents, leave the services each year. Among them are many doctors and other professional men, educators, future lawmakers, and others. They enter all walks of civilian life. Many of them, through contacts and associations in the service, for the first time have come to know and appreciate our profession. Every thinking veterinary officer, whether he be a rookie or an old hand, knows this well and strives to leave a correct impression of veterinary medicine in the mind of all those with whom he associates.

It is a fact also that hundreds of veterinarians enter and leave the service. Many receive training or experience that serves them and their community well in civilian pursuits.

Hundreds of veterinarians in the service have seen foreign lands, their cultures, their economic, political, health, animal disease, and veterinary problems. Certainly they are better citizens for having done so.

And, lastly, it has been my observation during the past 15 years of world travel, and it is my firm belief, that the veterinary officers we have sent abroad to so many lands constitute the most valuable group of goodwill ambassadors this country has ever mustered among our friends and allies overseas.

Even in these days of uncertainty our horizons are bright and bold. One who has witnessed the versatility and interest of today's young graduate as a veterinary officer and who has observed his accomplishments in so many widely divergent professional areas has no fear of the future for military veterinary medicine.

Animal Nutrition In Tomorrow's World

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PROGRESS is measured by the degree and rate of development. In animal nutrition, a great deal of progress has been made, that can be demonstrated accurately. Not only has the role of vitamins, minerals, and accessory growth factors, been determined but also that of nutrients in practical animal feeds. These findings are incorporated into practical animal feeding programs which provide the means for production of meat, milk, and eggs in greater volume, in far less time, at much less cost. The real measure of progress is the successful application of research to practical use in the field.

Poultry Nutrition

Research in poultry nutrition has pointed the way. Specific requirements for various vitamins and minerals were established. These were supplied by utilizing purified and semi-purified products of the laboratory, allowing for greater amounts of high energy contents of the feed. A trend has been established to high energy rations which continues to highlight nutrition research. Animal fats, stabilized to prevent rancidity, are being used as an additional source of energy for poultry feeds.

It appears that higher energy feeds represent a most important feature of tomorrow's poultry rations. Research suggests that with the higher energy diets, feed intake will decrease. As the feed intake decreases, the protein, vitamin, and mineral levels must be increased in such ratio to assure that birds will get amounts of essential elements they need while consuming smaller quantities of feed.

During recent months, poultry nutritionists have been concerning themselves with calories in relation to unit of protein ratios. These studies may result in new concepts of the make-up of formulas for more efficient feeds. At the present time, 42:1 seems to be the most desirable calorie to unit of protein ratio for starting broiler rations.

Dr. Morris Erdheim

In this high energy feed which will be eaten in smaller amounts, amino acid levels will have to be adjusted. Even now we are adding small amounts of methionine to present day high energy feeds. As the energy levels of the feeds go even higher, we shall have to give more attention to this and other of the critical amino acids.

In nutrition research, we seem always to be dealing with "unidentified factors". These are factors which are known to be needed, though they have not been isolated specifically. Yesterday's unidentified factors are the vitamins of today. Today's may be undiscovered vitamins, minerals, or unknown chemicals. At any rate, tomorrow's feeds undoubtedly will contain today's unidentified factors — with identifying names. Very likely a new set of unidentified factors also will be included in poultry rations.

Today's unidentified factors are found in natural sources — the fish factor in fish, the whey factor in milk products, and the grass-juice factor in green plants. However, fermentation products are rich sources of these. A great deal of work is being carried on at the present time with fermentation products for practical feeding programs. It may well be that these will assume even greater importance

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Fig. 1. Litter mates at five months of age fed as indicated, which illustrates graphically improvement in swine rations during the past half century.

Photo courtesy Feedstuffs

as ingredients for the poultry feed bag to produce tomorrow's chicken.

Improved Hog Ration

A few short years ago, hogs were raised in this country by feeding them corn and little else. The progressive grower fed some minerals and "protein" too. The protein may have been some oilmeal, but more likely tankage. Today, hog nutritionists smile when they think of that feeding program. Unfortunately, many hogs are still raised that way.

Hansen of Minnesota, dramatically demonstrated the progress made in hog nutrition. He fed litter mates a typical 1910 ration, a typical 1930 ration, and a typical 1953 ration. The results clearly demonstrate that more pigs can be marketed per sow in much less time and with far less feed by feeding properly balanced rations. (See fig. 1).

The turning point in modern day hog feeding came when McMillen and co-workers at Michigan State College demonstrated the importance of supplementing B-vitamins in hog rations. Not only are these important for growth, but they also play an important role in maintaining intestinal tone. We recognize that scouring pigs must be given a mixture of B-vitamins as one of the approaches to successful treatment.

Like poultry, hogs have shown a growth response when sources of unidentified factors were added to their rations. Quite likely, hog feeds of the future will be fortified more highly, and will contain higher energy. With this trend to get pigs to market earlier, we can reasonably expect at some future date, to market 200-lb. hogs at three months of age.

Research on the role of specific amino acids in hog nutrition already has been started. It is now known that not only must levels of various amino acids be adequate, but the balance between them must be correct.

Complexity of Ruminant Nutrition

The young calf is a nonruminant. Requirements parallel those of other single-stomached animals. Progress made in calf nutrition resulted in the development of workable milk replacers and practical calf starters. Future developments may be in the field of refining the vitamin levels, and determining the amino acid levels and their inter-relationships. The establishment of a rumen flora to convert the calf to a ruminant at an earlier age will continue to interest both researchers and practitioners.

The adult ruminant has been neglected by nutritionists until recent years. Perfection of the rumen fistula operation, and development of working artificial rumens have enabled nutritionists to do critical work in this field. In 1948, one paper was read at the American Dairy Science meeting on rumen microorganisms. In 1955, an entire session was devoted to the subject. During this period all sorts of papers were published establishing a foundation for practical developments in the future.

There are many billions of organisms in the rumen. So many different varieties are noted that attempts to classify them were given up by most persons who started such a project. We know that many kinds of bacteria, protozoa, and yeasts can be observed readily under the microscope.

In the mass of basic research findings are many facts. We know that some of these organisms manufacture B-vitamins. Others need B-vitamins for their own metabolism. Some are specific — the riboflavin producers are not the same as the pantothenic acid producers. It has also been shown that B_{12} is

produced when the diet contains cobalt.

Beeson and co-workers at Purdue University demonstrated in tests with identical twin calves that giving too much of any of the essential trace minerals would prevent normal growth.

Bentley at the Ohio State Experiment Station has been working with sources of factors or agents concerned with cellulolytic activity. A combination of B-vitamins and a factor in the fermentation products in rumen juice (valeric acid) definitely increased cellulolytic activity in the artificial rumen. A recent report by Bentley, suggests that the same thing happens in living steers. However, valeric acid is not needed as an additive in the feed. Apparently, the rumen organisms can make enough valeric acid from amino acids to function with the added B-vitamins.

Wise Burroughs at Iowa State College, is working along similar lines. He has repeatedly reported on the advantageous use of "rumen factors" which increase the effectiveness of organisms in the utilization of cellulose.

Since rumen microorganisms can utilize nitrogen to synthesize amino acids for their own use, we now appreciate that is is not essential to supply the feed of ruminants with a "balanced protein". In addition, we can supply some of the nitrogen from non-protein sources. At the present time, urea is being used in this manner. We can expect that other nitrogenous materials also will be found to be good protein substitutes.

The key problem in ruminant nutrition is increasing cellulolytic activity. We now know that certain natural materials are rich in factors capable of increasing cellulolytic activity. Nearly all are fermentation products and are rich in B-vitamins. Alfalfa ash also possesses excellent cellulolytic activity, and alfalfa is invariably included in supplements for cattle — particularly those to be fed with poor quality roughage. The alfalfa ash (in the form of alfalfa leaf meal) apparently helps the animal get more nutritive value from the poor roughage by breaking down available cellulose more completely.

Future cattle feeds and programs will be changed more radically from present day concepts than is the case with feeds for other classes of stock. The changes are found to be in the direction of aiding rumen organisms to increase cellulolytic activity. Quite possibly fermentation products will become more popular for ruminant feeding as sources of "rumen factors".

Improved nutrition for ruminants must also concern itself with improved agronomy practices. We know far more about soil fertility, rotation of pasture, and hay making than we practice in the field.

New Types of Feed Ingredients

For a variety of reasons, a never ending search for less expensive sources of nutrients continues. Waste animal fat, a by-product of the meat industry, was an important material in the manufacture of soaps. Since the development of detergents, the soap industry had less need for these fats. Research in poultry nutrition paved the way for the use of stabilized fats in poultry feeds.

Feather meal is getting some attention as a source of protein for poultry feds. There is also some indication that it may contain factors which increase cellulolytic activity. This work suggests that this material may find a place in ruminant feeds of tomorrow.

Two other waste products are being tested for their potential value in ruminant feeds. Poultry litter is being used in cattle feeding trials with some success. Because of the urinary waste products in the litter, the material has some value as a replacement for more expensive sources of protein.

German workers fed some specially treated waste wood products to cattle during the war. A more recent development along these lines, is the feeding of waste wood products which are subjected to atomic radiation. Apparently this treatment makes the cellulose of the wood more readily available to the animals.

These are but some of the "waste" products being converted to usable feed ingredients. More activity along these lines can be expected.

Medication of Feed

The inclusion of medicaments in feeds is not only accepted as normal, but the trend is definitely toward increased use.

Some medicaments are being used as growth promoters. In this category must be included, antibiotics, when used at nutritional levels, arsenicals, and hormones (stilbestrol).

Other medicaments are used in "therapeutic feeds." These include antibiotics and arsenicals used at high levels, such as are now employed for poultry and hogs — particularly in enteric conditions.

"Worming" feeds are increasing in popularity. These include "wormers" for treatment as well as low-level feeding of medicaments for prevention of internal parasitism. Coccidiostats are added routinely to poultry

feeds for preventive purposes, and many coccidiostats are available for this purpose.

More recent additives for "preventive feeds" are antifoaming agents for bloat, and sodium propionate for acetonemia control.

Since the trend towards medication is increasing, the veterinary profession will have to do some clear thinking to determine a practical approach to the problem. It seems reasonable that the feed manufacturer, who has the proper equipment, can do a much more effective job in micro-mixing small amounts of medication in the feed if he decides to become a diagnostician *in absentia* and uses these special feeds for treatment. It may not be a utopian dream to predict that practicing veterinarians will arrange with local mixers to do special "medicated-feed-mixing" for them on a prescription basis.

The veterinarian also will have to familiarize himself with the line of feeds sold in his area, so that he can prescribe the best one for special purposes — much as a physician prescribes a proprietary medicine package.

The challenge faced us squarely in poultry practice. We ignored it, and thus encouraged the practice of medicating poultry feeds. A similar situation presented itself with the advent of artificial insemination. While artificial insemination was put into lay hands, most practitioners now work with inseminators on an intelligent basis. The inseminator usually advises the owner of something wrong in the genital system and calls the veterinarian. It appears that in the interest of giving better service, the veterinarian will have to adapt medicated feeds to his use. In a number of instances this is already happening.

In the changing world of tomorrow, animal nutrition will develop with exciting progress. No less important than any of the other developments mentioned, is the prevention of disease through sound nutrition. *The veterinarian in the field is a key figure in that picture.*

Few people who have occasion to visit with farmers in an advisory capacity are better qualified than the practicing veterinarian to utilize sound nutrition knowledge for prevention of disease. His training, experience, and professional interest make his suggestions more acceptable to the client. It seems clear that the practitioner who has a keen interest in nutrition will have another excellent tool which will aid him in the service he renders his client as he formulates programs for prevention of disease and maintenance of poultry and animal health.

High level vitamin D fed to preparturient cows for the prevention of postpartum hypocalcemia is fast gaining interest in dairy cattle practice. Veterinarians in large animal practice are advising their clients on the use of adequate levels of vitamin A to assist in prevention of certain sterility problems of nutritional origin. They also are helping their clients by reviewing feeding programs to insure adequate vitamin D, calcium, and phosphorus intake to prevent metabolic bone disorders. B vitamins are prescribed to help prevent nutritional scours in pigs. Pasture rotation and sound grass-feeding practices are also in the veterinarian's scope as he advises the livestock owner on programs for disease prevention.

The equine practitioner of yesterday did not despair with the advent of the automobile. He took advantage of what it could do for him. He bought a car, and it enabled him to render greater service to the livestock industry.

Physicians were disturbed when pharmaceutical houses first began offering ready-mixed preparations for given conditions, because it infringed on their "prescribing". However, they soon realized that it was to their advantage to use these preparations, on a prescription basis, and they learned how best to make use of the service.

It is reasonable to expect that the veterinarian of tomorrow will be in a position to offer his clients much greater service by taking advantage of the progress being made in animal nutrition and the technical developments in the feed industry.

▼ ▼ ▼

Estrogenic Toxicity

A dietary supplement of stilbestrol (6 mg. per lb. of food) and thyroxine (0.3 mg. per lb. of food) with and without addition of antibiotics failed to stimulate growth rate or food conversion in 18 pigs. Experiments were reported by Taylor and Gordon[81].

Five cases of toxicity, three of them fatal, occurred in the stilbestrol-thyroxine fed animals. Symptoms resembling those of estrogenic toxicity in laboratory animals could be reproduced by feeding stilbestrol alone at the rate of 20 mg. per lb. of food.

---

[81]Taylor, J. H., and Gordon, W. S., The Effect of Feeding a Diet Containing Stilbestrol and Thyroxine to Growing Pigs with Special Reference to the Toxicity of Stilbestrol. *Vet. Rec.*, 67:48 (Jan. 15), 1955.

Public Health Workers to Meet in Kansas City

In all, more than 400 scientific papers will be presented on public health topics ranging from prevention of home accidents caused by the do-it-yourself trend, to combatting cancer, tuberculosis, smog and radioactive fall out. Members of various professions within public health—physicians, nurses, dentists, veterinarians, engineers, sanitarians, statisticians, nutritionists, entomologists, biologists, health educators and others—will share latest findings in their fields at the 83rd annual meeting of the American Public Health Association in Kansas City, Mo. Municipal Auditorium, November 14-18, 1955. It is expected that this meeting will bring together more than 5,000 public health specialists from all parts of the United States and from many foreign countries.

Among topics to be emphasized are mental health, the Salk polio vaccine, neighborhood planning, new approaches to chronic diseases and experience with various medical care plans.

General sessions are scheduled for presentation of the highest awards in public health, the Albert D. Lasker Awards of the American Public Health Association and the Sedgwick Memorial Medal.

The American Public Health Association is the largest professional organization of public health workers in the world, with more than 15,000 members throughout the Western Hemisphere. Its meetings annually attract delegates from most of the countries of the world.

A number of papers of especial interest in the veterinary field will be presented at general sessions and sectional meetings.

▼ ▼ ▼

Central Alabama Association

The Central Alabama Veterinary Medical Association met August 4, 1955 at the Officers' Club of Maxwell Air Force Base. After cocktails and dinner, an interesting business session was presided over by Lt. Colonel Robert L. Hummer, president of the organization. Guest speakers included Dr. H. C. Morgan of the Department of Physiology at Alabama Polytechnic Institute and Dr. Richard W. Winters, Associate Director of Veterinary Professional Services, Lederle Laboratories. Among the honored guests was Dr. R. S. Sugg, dean of the School of Veterinary Medicine, Alabama Polytechnic Institute, Auburn.

NEW 'Antilepto'

LEPTOSPIRA BACTERIN

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Annual losses from bovine leptospirosis are estimated at over 112 million dollars—25 million dollars greater than losses from bovine brucellosis.[2] With *new* 'ANTILEPTO', semi-annual vaccination of beef and dairy cattle will control the spread of the disease—check losses in animals and milk.

Available exclusively to licensed veterinarians.

Supplied: 25-cc. (5-dose) and 100-cc. (20-dose) vials.

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References: 1. Brown, A. L., et al.: To be published. 2. Agricultural Research Service, Losses in Agriculture, June 1954, Table 20, p. 129.

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A Dutch lens grinder named Leeuwenhoek invented the microscope during the latter part of the 17th century, but the discovery of bacteria had to await the arrival of an improvement called the oil immersion lens. In the mid-1930's the Radio Corporation of America invented a new kind of microscope which gave much greater magnification, sufficient to visualize virus particles. These can now be measured and something learned of their structure and characteristics. However, scientists are not agreed as to whether they are living organisms, nonliving proteins, or some as yet undescribed entity.

▼ ▼ ▼

On the tomb of King Antifad, who lived at Thebes, 3800 B. C., are portraits of his four dogs, graven in stone with their names underneath. Each dog wears a collar. One resembles a Foxhound; one a curly tail, upright ears, and is presumed to be a housedog; the third is a type of Mastiff; the fourth is similar to our modern Dalmatian.

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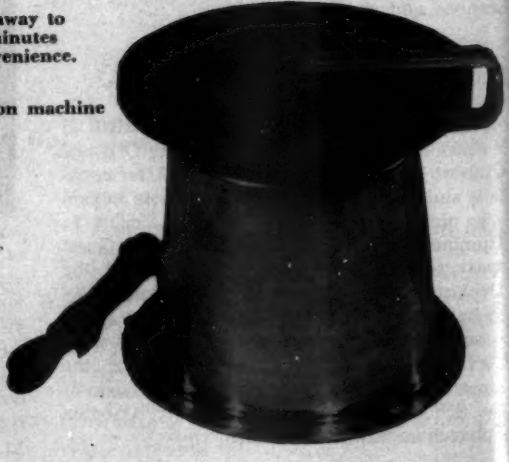

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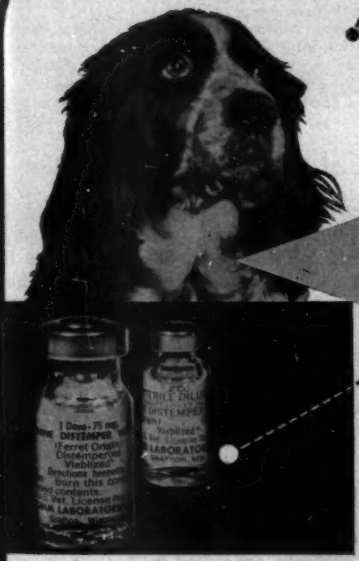

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Recently published papers and doctors' reports* show the trend is to Distemperoid Virus as the agent of choice against canine distemper when used either PROPHYLACTICALLY or THERAPEUTICALLY. The reports also show a preference for Distemperoid Virus for its advantages in the control of Hard Pad disease.

*Signed reports in Laboratory files at Grafton

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Robert G. Bramel

Dr. Robert G. Bramel, ILL. '52, has been appointed to the veterinary staff of Sharp & Dohme, Division of Merck & Co., Inc.

Dr. Bramel joined the Philadelphia pharmaceutical firm following three years of private veterinary practice in Springfield, Ill. He is a graduate of the University of Illinois where he received his B.S. in Bacteriology in 1948 and his D.V.M. in 1952.

▼ ▼ ▼

Flesh of Irradiated Animals Nontoxic

Theorizing on the possible toxicity of flesh from animals receiving lethal doses of gamma radiation, Wasserman and Trum[21] based their opinion that such flesh would not prove harmful if consumed on the biophysical conceptions of the interaction of radiation and matter.

Dogs and mice fed flesh from lethally irradiated cows and sheep indicated no statistical difference for controls whose diet was equal except for the source of the meat portion.

▼ ▼ ▼

Jean de la Ruelle's work, "Veterinariae Medicinae" appeared in Paris in 1530 and Snapes' "Anatomy of the Horse" in London in 1683. These volumes, separated by 150 years, afford greatest contrast in style. They mark gradual changes in outlook from a blind faith in the classic, to the modern and more practical method of examination and observation.

▼ ▼ ▼

Veterinary supply houses were developed in the wake of demand for hog cholera antiserum and virus. There were practically no such establishments up to that time.

[21]Wasserman, R. H., and Trum, B. F., Effect of Feeding Dogs the Flesh of Lethally Irradiated Cows and Sheep. *Science*, 121:894 (June 24) 1955.

NEW 'Antilepto'

LEPTOSPIRA BACTERIN

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References: 1. Brown, A. L., et al.: To be published. 2. Agricultural Research Service, Losses in Agriculture, June 1954, Table 20, p. 129.

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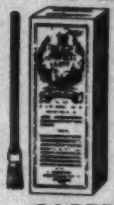

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New President of Ft. Dodge Laboratories

Dr. Burton J. Gray (ISC '43) has been elected president and general manager of Fort Dodge Laboratories, Inc., Fort Dodge, Iowa. He succeeds Scott L. Barrett, who has been elevated to the new office of chairman of the board.

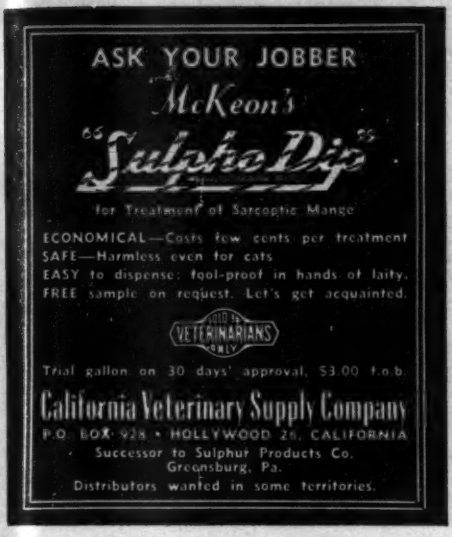
Dr. Burton J. Gray

Doctor Gray joined the Fort Dodge organization in 1944, and shortly thereafter was assigned to assist the late Dr. H. J. Shore, director of the biological laboratories.

Mr. Scott L. Barrett

In 1949 he was appointed superintendent of the biological farm, and in 1951, assistant director of the biological laboratories. Upon the death of Doctor Shore in 1952, he was made laboratory director, and in 1953 was elected a vice-president and member of the

(*Continued on page 663*)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(*Continued from page 660*)

board of directors of the company. In June of the present year he was made executive vice-president.

In 1954 Doctor Gray was named by the Iowa State Junior Chamber of Commerce as the "outstanding young Iowan of the year."

Mr. Barrett joined the then Fort Dodge Serum Company as sales manager in 1919, only seven years after its founding. He was made president of the company in 1946. His entire business life has been devoted to the veterinary biological and pharmaceutical industry.

▼ ▼ ▼

Egg Production of *Haemonchus contortus*

Daily observation and collection of fecal passage from a bull calf having a pure infection of *H. contortus* enabled Kelley[25] to determine daily egg production of this nematode, common parasites of cattle.

He concluded that female worms in this calf laid an average of 6,550 eggs per day. The epizootiological importance of this phenomenal rate becomes apparent when one considers that in a calf harboring 50 female worms, a light infection, some 300,000 worm eggs would be deposited daily.

▼ ▼ ▼

Disraeli and Napoleon were passionate ailurophobes — they despised cats.

[25]Kelley, Geo. W., Jr. *Jour. Parasit.*, Apr. 1955.

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These products are backed by some of the most critical and extensive research projects ever undertaken for the express purpose of evaluating an anthelmintic.

Tests consisted of twenty-three separate projects involving 61 head of cattle. Each individual animal was observed continuously after treatment for an average of 96 hours. In addition to clinical observations, all fecal and urinary excreta was recovered and chemically analyzed for phenothiazine content. In this way many formulas were tested to show which formula:

1. Retained the greatest amount of the drug in the fourth stomach and intestines in contact with the internal parasites.
2. Gave the least absorption from the first three stomachs thus lessening the effect of intoxication which sometimes follows high absorption into the blood stream.
3. Gave the highest or peak percentage in the feces, which is closely correlated with the recovery of the greatest number of worms.

Other tests in which the animals were sacrificed at various intervals after treatment showed the improved formulas gave the highest return of phenothiazine, producing in effect results equal to much larger initial doses. These improved formulas contain phenothiazine of the smallest particle size, assuring greater dispersal and more intimate contact with internal parasites.

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References: 1. Brown, A. L., et al.: To be published. 2. Agricultural Research Service, Losses in Agriculture, June 1954, Table 20, p. 129.

The war years (1918) brought about another battle of the horse. This was not concerned with whether or not it would reign supreme over the auto, but whether it would be consumed on the dinner table.

▼ ▼ ▼

Shortly after the turn of the century Iowa was reported to have established for practice within state boundaries 221 graduate veterinarians and 544 non-graduate practitioners.

▼ ▼ ▼

In 1914, Dr. K. F. Meyers exhibited and explained pictures of bluetongue in sheep.

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Dr. Frank Thorp Victim of Poliomyelitis

Dr. Frank Thorp, Jr., Department of Animal Pathology, Michigan State College, East Lansing, died suddenly while vacationing in Colorado. His death was ascribed to bulbar poliomyelitis, and we are informed that he was ill for only 24 hours prior to his passing.

Dr. Frank Thorp, Jr.

Doctor Thorp, with his family, was vacationing in the "four corners" area of Colorado, a favored vacation spot, and had just returned from a river trip shooting the turbulent rapids of the Colorado River.

Doctor Thorp referred, on occasions when he was called upon to speak before veterinary groups, as functioning as a member of a research team. He served as a research scientist both at the Colorado Experiment Station and at Michigan, joining the latter group in 1940. His work on listeriosis in sheep and cattle, and deficiency diseases of swine are best known of his many contributions to veterinary science and literature.

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Sin-jex **is the first Distemper-Hepatitis vaccine to utilize a vacuum dried *modified live virus* distemper fraction, with killed virus hepatitis fraction as diluent. *Sin-jex* gives more positive immunity against distemper: because the modified live virus distemper fraction elicits a more marked immunity response. *Sin-jex* is instantly reconstituted because of the R_L "reconsti-quick" feature. *Sin-jex* is a fine homogenous suspension which passes easily through a 22 guage needle. *Sin-jex* is easily administered with a single subcutaneous injection. *Sin-jex* may be given simultaneously with or without Anti-Canine Distemper-Infectious Hepatitis Anti-Serum. *Sin-jex* produces immunity in less than two weeks. *Sin-jex* may be used before or after weaning.**

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New Members of Professional Staff—Ashe Lockhart, Inc.

Ashe Lockhart, Inc. announces the addition of three new veterinarians to their staff.

Dr. Jake D. Fortenberry has been appointed to the newly-created position of sales supervisor; Dr. Franklin W. Binkley is associated with the research and production department, and Dr. Frank A. O'Donnell assigned to serum production. He will also serve as farm manager.

Doctor Fortenberry, who joined Ashe Lockhart, Inc. in October of this year, was graduated from Arkansas State College in 1941, and after four years with the Marines, he returned to school and was granted his D.V.M. from Kansas State College in 1949. Upon graduation he became a field veterinarian for Cutter Laboratories, a position he has held to the present time. He is married and has three daughters.

Doctor Binkley, after serving five years with the Army, was graduated from Michigan State College in 1949 and continued his schooling until 1953 when he was granted his D.V.M. Upon graduation he was appointed a field inspector for the Bureau of Animal Industry in Indianapolis, Indiana. He held this position until the acceptance of his present position in June of this year.

Dr. Jake D. Fortenberry

Doctor O'Donnell was graduated from Kansas State College in 1954. After receiving his D.V.M. he entered practice at Louisburg, Kansas, and made his home there until April of this year when he joined the staff of Ashe Lockhart, Inc. Doctor O'Donnell served two years in the Army, is married and has two daughters.

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MEETING CALENDAR

Interstate Veterinary Medical Association. Annual meeting. Martin Hotel, Sioux City, Ia., November 1-2, 1955. K. W. Smith, 510 West 19th St., Sioux City, secretary.

Midwest Small Animal Association and the Regional A.A.H.A. Hotel Burlington, Burlington, Ia., November 9-10, 1955. J. Porter Coble, 2828 South MacArthur Blvd., Springfield, Ill., secretary.

American Public Health Association. Annual meeting. Municipal Auditorium, Kansas City, Mo., Nov. 14-18, 1955. American Public Health Association, Inc., 1790 Broadway, New York 19, N. Y.

U. S. Livestock Sanitary Association. Annual meeting. Jung Hotel, New Orleans, La., Nov. 16-18, 1955. R. A. Hendershott, I W. State St., Trenton 8, N. J., secretary.

Animal Care Panel. Annual meeting. Henry Hudson Hotel, New York, N. Y., December 1-2, 1955. Robert J. Flynn, P. O. Box 299, Lemont, Illinois, secretary.

Arizona Veterinary Medical Association. Winter meeting. Chandler, Ariz., December 2-3, 1955. George S. Calderwood, 926 Apache Blvd., Tempe, secretary.

Kentucky Veterinary Medical Association. Ken-Lake Hotel, Hardin, Ky., December 5-6, 1955. Robert H. Singer, 136 Shawnee Place, Lexington, secretary.

Cornell University Conference for Veterinarians. Annual. New York State Veterinary College, Ithaca, N. Y., January 4-6, 1956. W. A. Hagan, dean, Cornell University, Ithaca.

Oklahoma Veterinary Medical Association. Annual meeting. Hotel Mayo, Tulsa, Okla., January 8-10, 1956. C. H. Faulks, 3421 N.W. 20th St., Oklahoma City, secretary.

Indiana Veterinary Medical Association. Annual meeting. Hotel Severin, Indianapolis, Ind., January 11-13, 1956. L. M. Borst, 3315 Shelby St., Indianapolis, secretary.

Iowa Veterinary Medical Association. Annual meeting. Hotel Ft. Des Moines, Des Moines, Ia., January 17-19, 1956. F. B. Young, Waukee, secretary.

Virginia Veterinary Medical Association. Annual meeting. Hotel John Marshall, Richmond, Va., January 22-24, 1956. Wilson B. Bell, 210 Clay St., Blacksburg, secretary.

California State Veterinary Medical Association. Mid-winter conference. School of Veterinary Medicine, University of California, Davis, January 23-25, 1956. Charles S. Travers, 3004 16th St., San Francisco, executive secretary.

Illinois State Veterinary Medical Association. Annual meeting. Hotel LaSalle, Chicago, Ill., February 20-22, 1956. C. B. Hostetler, 1385 Whitcomb Ave., Des Plaines, secretary.

Colorado A. & M. Annual Conference for Veterinarians. Glover Veterinary Hospital, School of Veterinary Medicine, Colorado A. & M. College, Ft. Collins, Feb. 20-26, 1956. O. R. Adams, head Veterinary Clinics and Surgery, chairman.

▼ ▼ ▼

Observations made by Fenton (*Poultry Tribune*, Aug. 1955, page 14) have convinced him that pullets reared in average New Jersey farmer poultry houses should have at least 3 sq. ft. floorspace per bird.

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Includes all essential factors in effective proportions to meet the requirements of gestation, lactation, growth, convalescence and maintenance of vigor and alertness.

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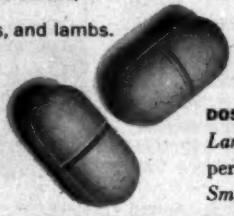

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Large animals: 5 to 10 mg. per lb. per day, preferably in divided doses.
Small animals: 25 to 50 mg. per lb. per day, in 2 to 4 divided doses.
For infectious enteritis: ½ to 2 tablets for 1 or 2 days are usually sufficient.

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DOSAGE FOR INTRAUTERINE THERAPY

This depends on several factors, such as the size of the animal, the severity of the infection, the response to treatment, and the convenience of re-treatment. 1 or 2 boluses placed in the vagina or in each horn of the uterus and repeated once or twice at 24- to 48-hour intervals will usually provide effective medication.

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—DEATHS OF VETERINARIANS—

Simon Wayne Alford, Lincoln, Neb., KCV '10. May 14, 1955.

E. V. Beamer, Des Moines, ISC '40, died recently.

Charles E. Dille, Cairo, Ill., CVC '04, June 26, 1955.

Herbert William Elder, Manning, S. C., GWU '11, June 6, 1955.

Charles F. Henry, Westchester, Pa., KCV '15, June 8, 1955.

Fred B. Jones, Dixon, Ill., CVC '15, August 5, 1955.

Roy E. Kyner, Humeston, Ia., ISC '11, May 6, 1955.

O. E. Lowe, Charlottesville, Ind., IND '12, February 2, 1955.

Earl T. Martin, Las Vegas, Nev., KCV '14, September 13, 1955.

Harold F. Newton, Adams City, Col., COLO '41, June 12, 1955.

William Arthur Shoults, Calgary, Atla., ONT '92, May 24, 1955.

George B. Winch, George, Ia., CVC '14, June 28, 1955.

▼ ▼ ▼

The state veterinarian of Nebraska stated that the so-called Kansas-Nebraska horse plague caused the loss of 12,000 animals in Nebraska during an eight-week period in 1913. An estimated 25,000 died that season.

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References: 1. Brown, A. L., et al.: To be published. 2. Agricultural Research Service, Losses in Agriculture, June 1954, Table 20, p. 129.

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